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MODEL-102

1. VCO (Voltage Controlled Oscillator)

Frequency Range: 3 Hz – 40 KHz
 VCO Output: 10 Vp-p
 VCO Sync. Input: Strong and Weak

CONTROLS

Waveforms: Triangular, Sawtooth, Square, Pulse (Pulse Width Controlled)
 Frequency: 10 Hz – 10 KHz (at A2 key) continuously variable
 Fine Tuning: 1 oct.
 Pulse Width: 5% – 50% (Manual, ADSR, LFO)
 Ext. CV or S/H: 1V/oct.
 LFO

2. RING MODULATOR

Ext. Input: 10Vp-p
 Ring Modulator Output: 10Vp-p

3. AUDIO MIXER

Ext. Input Impedance: more than 50KΩ

CONTROLS

VCO, Ring Modulator, Ext. Input

4. HIGH PASS FILTER

HPF Cutoff Frequency: 10 Hz – 10 KHz

5. VCF (Voltage Controlled Filter)

Cutoff Frequency Range: 20 Hz – 100 KHz

CONTROLS

VCF Cutoff Frequency: 20 Hz – 20 KHz
 Resonance: 0 – self oscillation
 LFO/Ext. CV: 1V/oct.
 KYBD CV
 ADSR

6. VCA (Voltage Controlled Amplifier)

CONTROLS

Initial Gain
 LFO
 ADSR

7. ENVELOPE GENERATOR (ADSR)

KYBD Gate Input: +14 from MODEL 101
 KYBD CV Input: 1V/oct. from MODEL 101
 ADSR Output: +6V (contour peak)
 Env. Input: +6V (contour peak)

CONTROLS

Attack Time: 0.4 msec – 3 sec.
 Decay Time: 0.8 msec – 6 sec.
 Sustain Level: 0 – 100% (contour peak)
 Release Time: 0.8 msec – 6 sec.

8. LFO (Low Frequency Oscillator)

Wave Form: Sawtooth, Sine, Square

CONTROL

LFO Frequency: 0.15 Hz, -25 Hz

9. SAMPLE AND HOLD

Ext. Input: 10Vp.p

S/H Output:

Clock Output: ± 14.4 V**CONTROLS**

Sample Mode: OFF, Sawtooth, Reverse Sawtooth, Triangular, Ext. Input

Sample Time: 0.6 Hz - 125 Hz

Output Lag: 0 - 2 sec.

10. OUTPUT MIXER

Input: 6Vp-p max.

Input Impedance: 50K ohm

11. AUDIO SIGNAL OUTPUT

High Output: 3Vp-p with 1K-ohm output impedance.

Low Output: 0.3Vp-p with 1K-ohm output impedance.

12. HEADPHONE OUTPUT

0.3V max. into standard 8-ohm stereo headphones.

13. DIMENSIONS AND WEIGHT

Overall Size: 610 mm wide, 155 mm deep, 305 mm high.

Net Weight: 7.5 Kg

14. POWER REQUIREMENTS

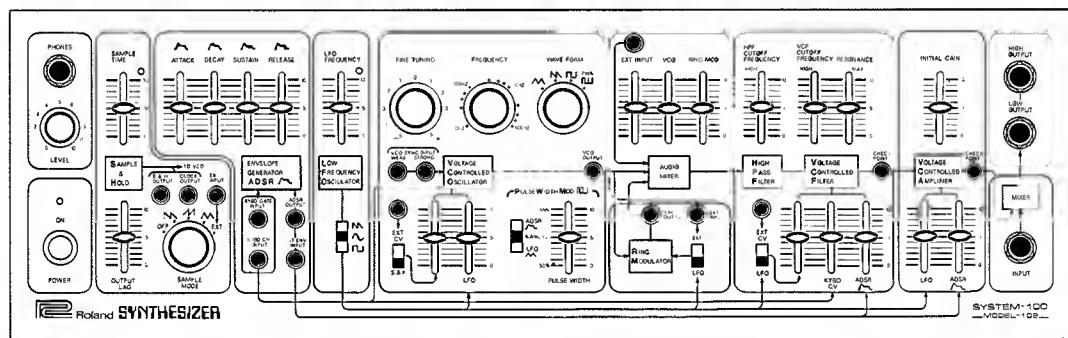
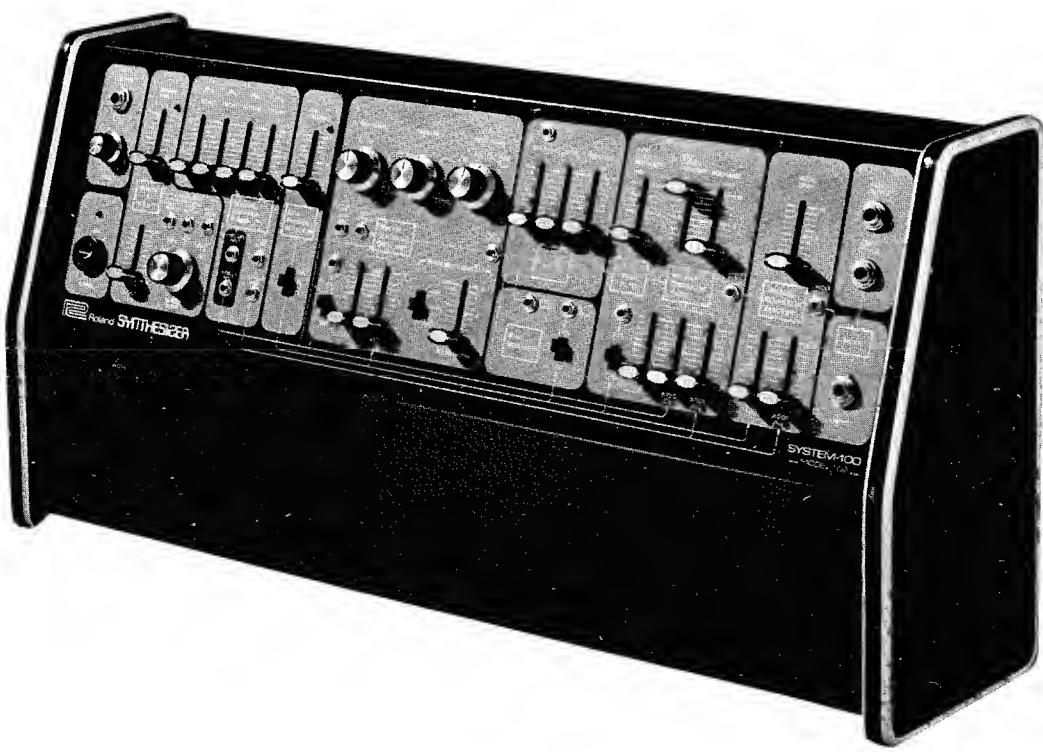
100 - 120V 50 - 60 Hz

220 - 250V 50 - 60 Hz

15. POWER CONSUMPTION

10W max.

PANEL DIAGRAM



DISASSEMBLY

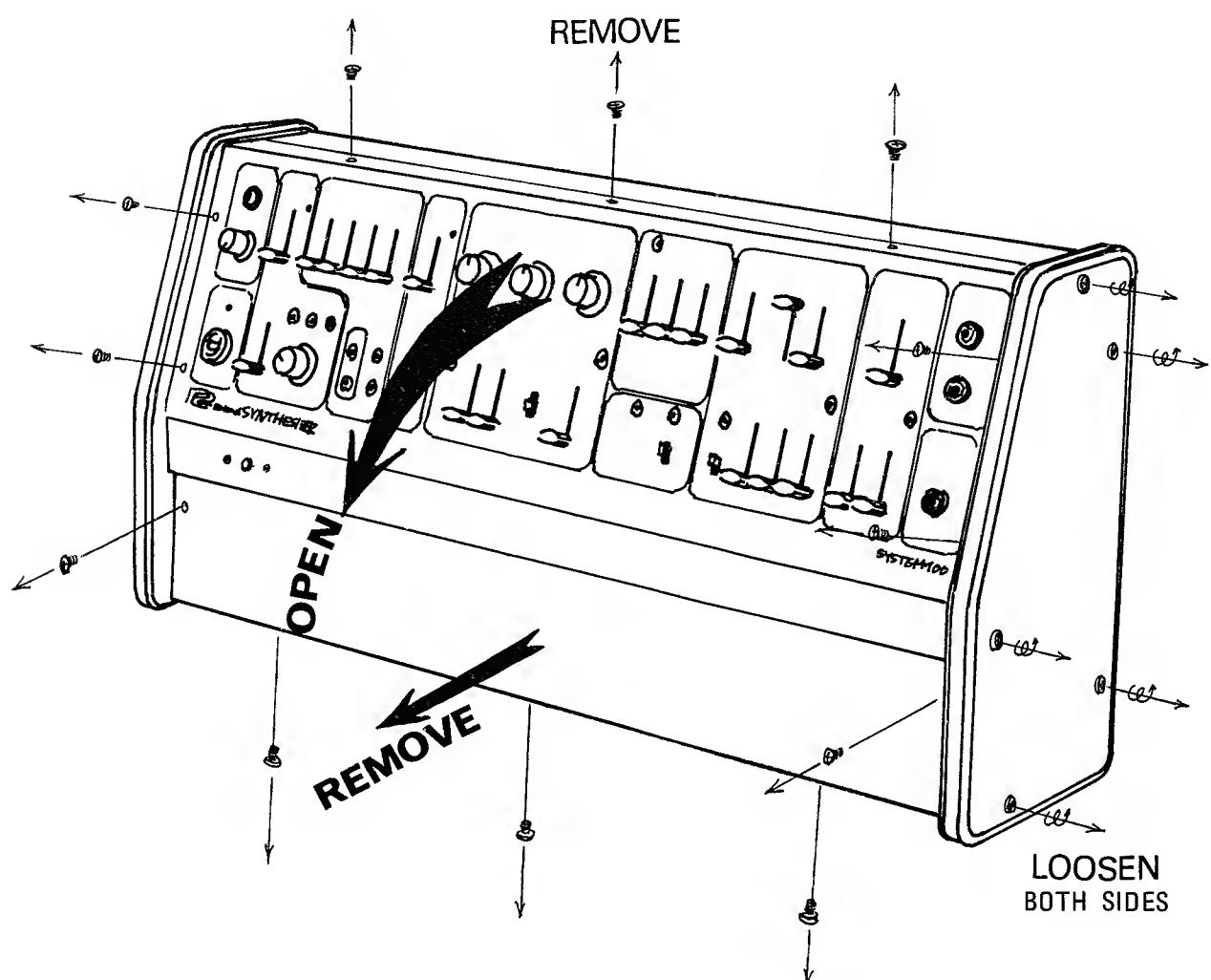
System-100, Model-102 can be disassembled in the following steps when necessary for checking and readjustment.

The power cord must be disconnected from the power source before proceeding with disassembly.

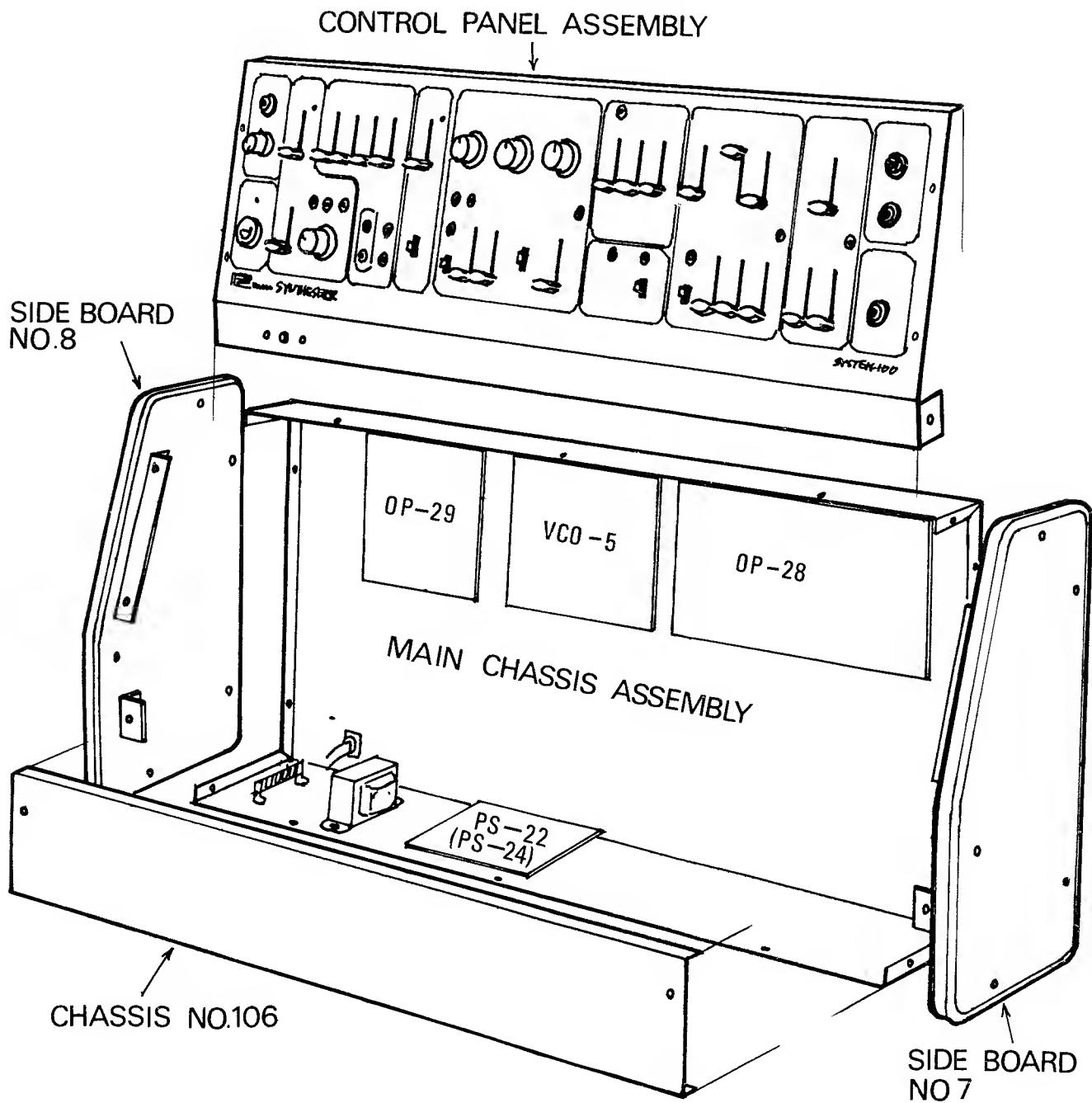
Remove the 5 screws on the lower front chassis.

Remove the 7 front panel screws and also loosen the 10 side board screws. The panel can be opened by pulling the top of the panel.

Use a string through the screw holes to keep the front panel from falling too far forward.



GENERAL LAYOUT



DESCRIPTION of PCB(Printed Circuit Board) ASSEMBLY

Since the circuits of the Model 102 are similar to or the same as the Model 101 circuits, refer to the Model 101 section of this manual (pp. 7, 8) for circuit descriptions not given below.

1. VCO BOARD ASSEMBLY (VCO-5)

1-1. SAMPLE and HOLD

This circuit takes the periodic samples of voltage levels from the LFO waveforms or external source to produce different patterns of up and down voltage steps.

2. VCF VCA BOARD ASSEMBLY (OP-28)

3. RING BOARD ASSEMBLY (OP-29)

3-1. RING MOD is a device which makes use of the double balanced modulation by an IC.

The RING MODULATOR is a balanced multiplier which suppresses the two input frequencies but passes both the sum and difference frequencies of the inputs.

3-2. The CLOCK OSC determines the sample timing of the Sample and Hold circuit.

3-3. The LAG is a variable RC time constant for rounding off the sharp edges of the Sample and Hold output waveform.

3-4. The INVERTER is used to invert the LFO waveform for use in the Sample and Hold circuit.

3-5. The VCO SYNC function uses an external pulse (usually the square wave output of the Model 101 VCO SYNC OUT jack) to synchronize the Model 102 VCO to an external source.

4. POWER SUPPLY BOARD ASSEMBLY (PS-22, PS-24)

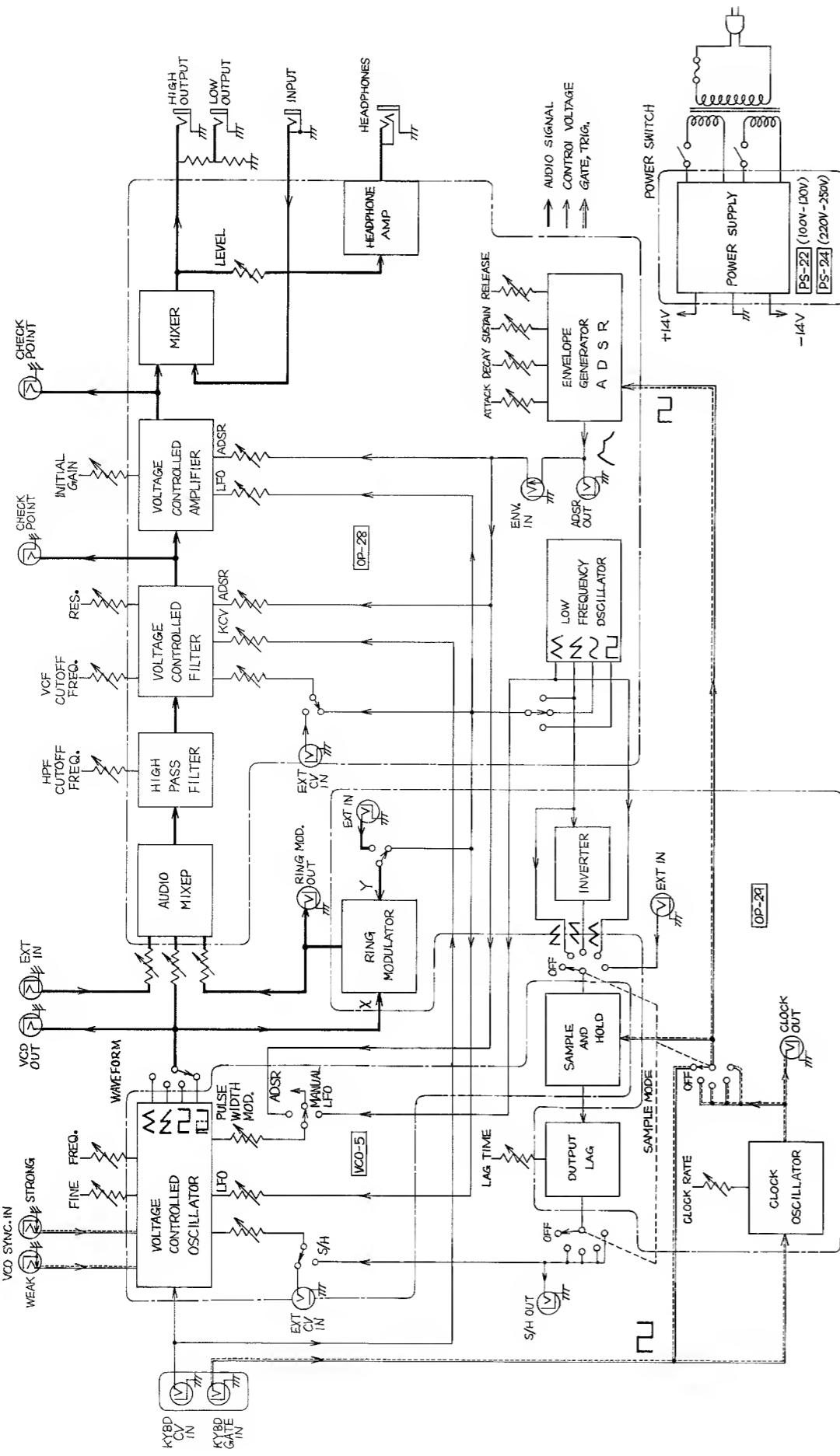
This assembly is a voltage regulator circuit which provides constant voltages of +14V and -14V.

Note: The PS-22 board is for 100V - 120V, while the PS-24 board is for 220V - 250V.

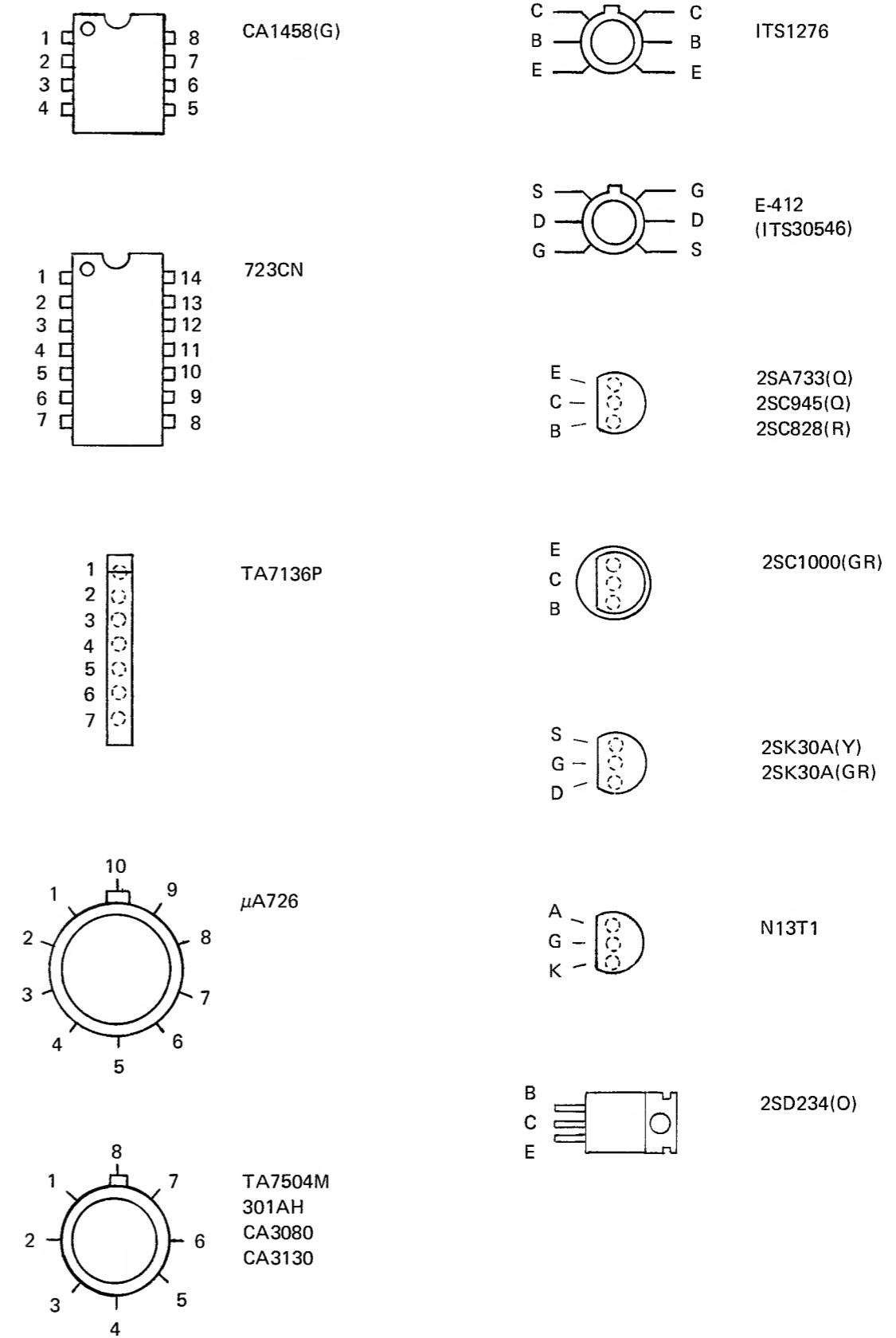
Fuse 0.5A, Fuse Holder TF-758, of Label No. 69, are used on PS-24 alone.

For PS-22, use a jumper wire on the Fuse Holder.

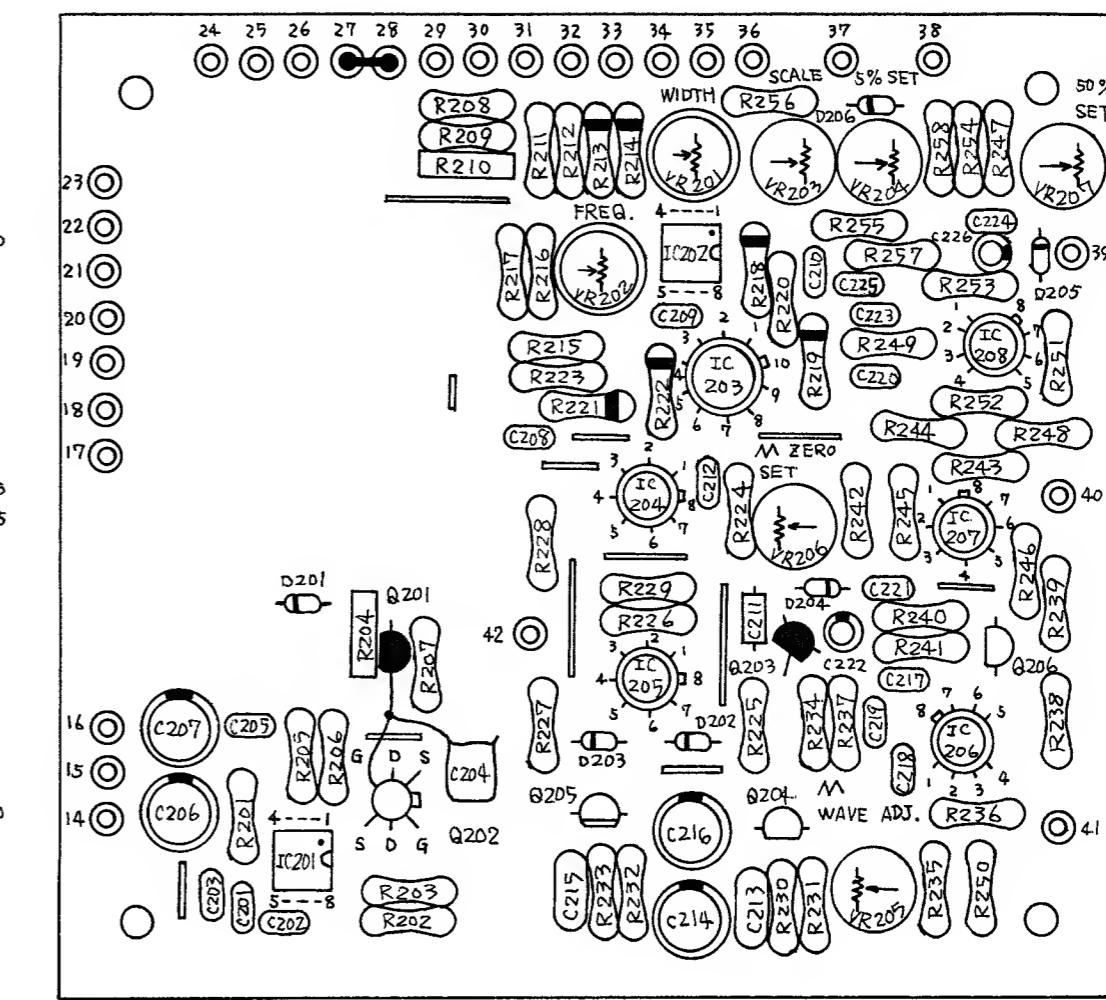
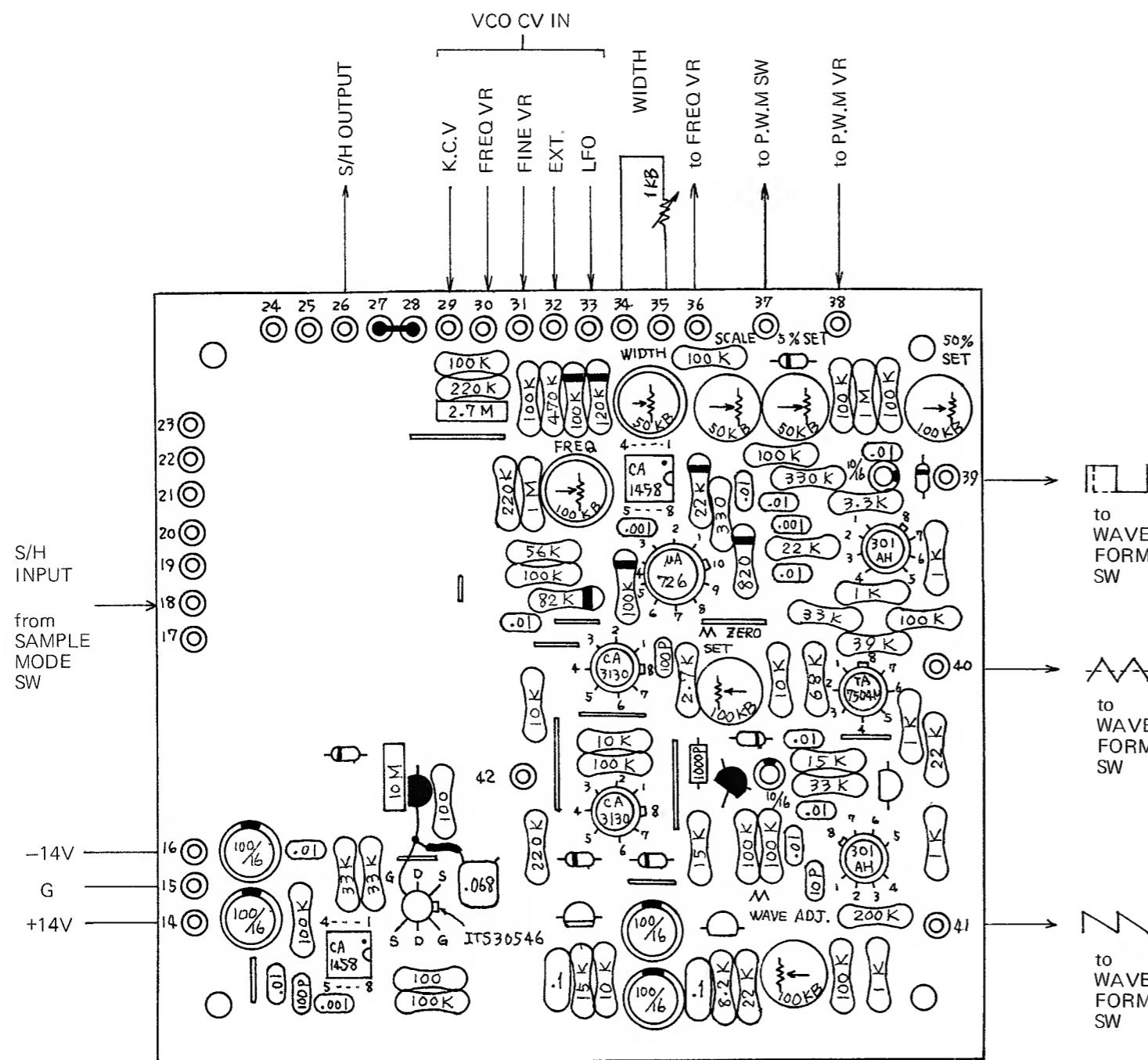
GENERAL BLOCK DIAGRAM



SEMICONDUCTOR ELECTRODES (TOP VIEW)



VCO-5 VCO BOARD ASSEMBLY PARTS LAYOUT (152-005)



： Metal Film Type

102J
1000P : Polystyrene
Film Capacitor

— : Carbon Type

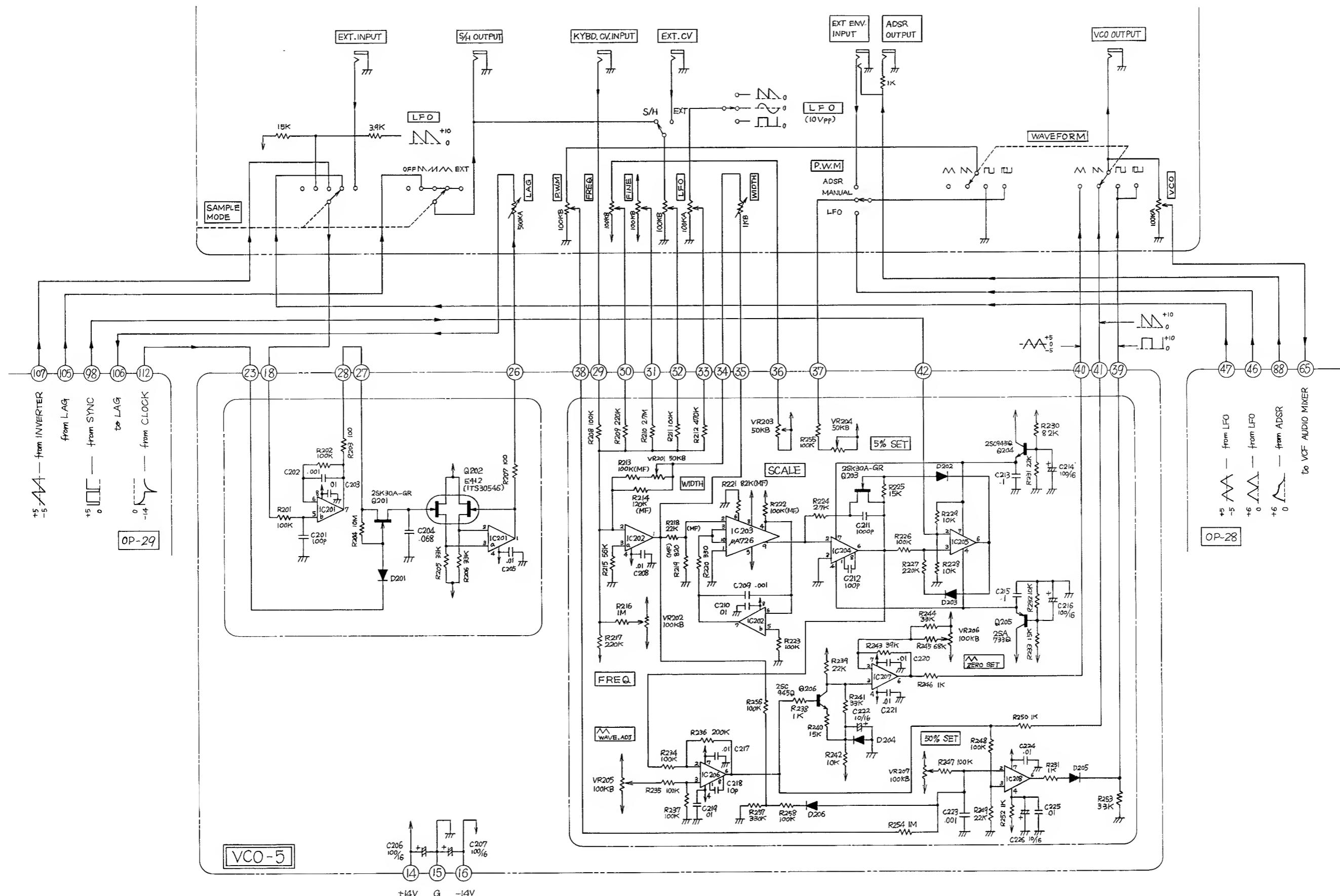
2SK20A / C

1S2473

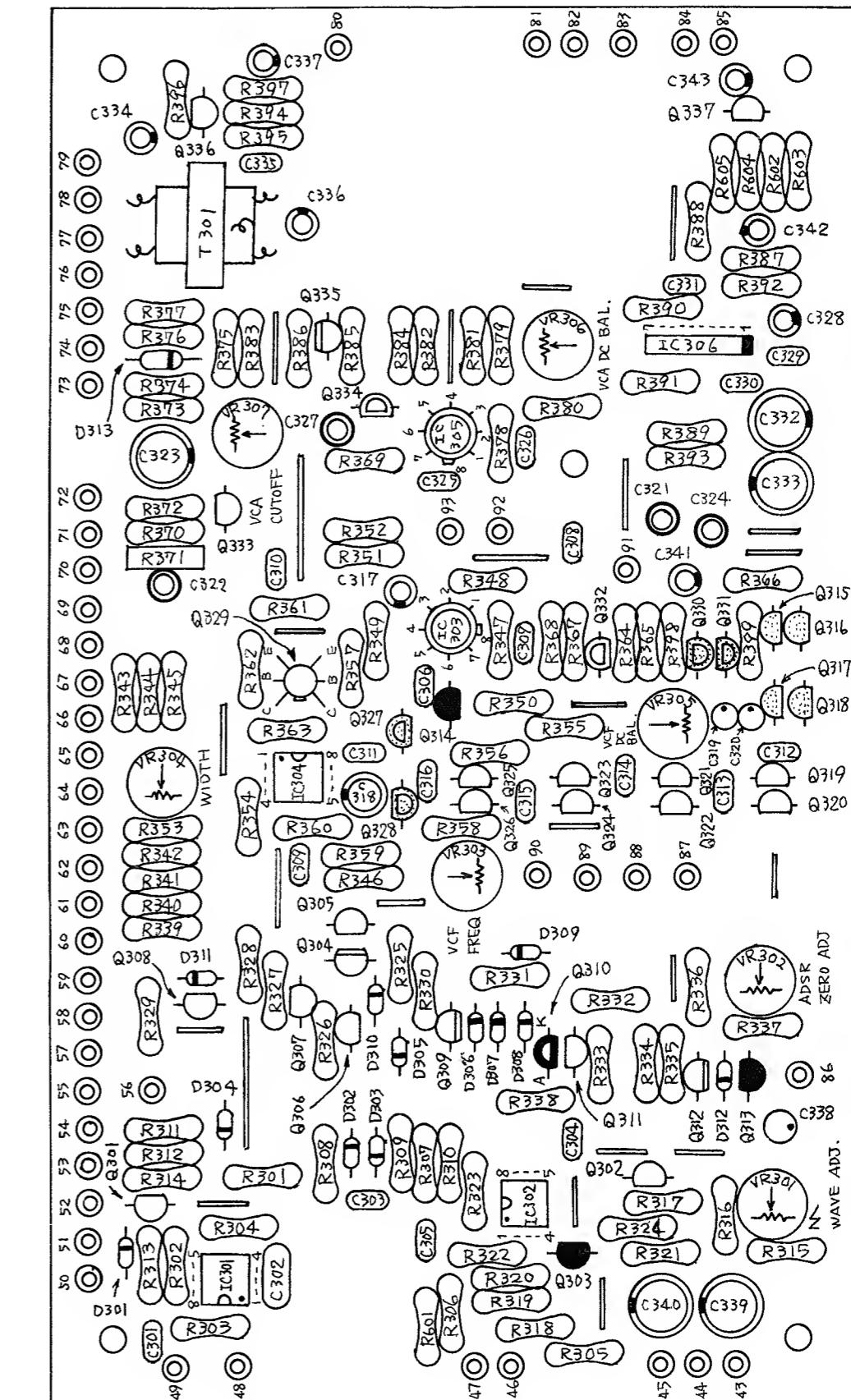
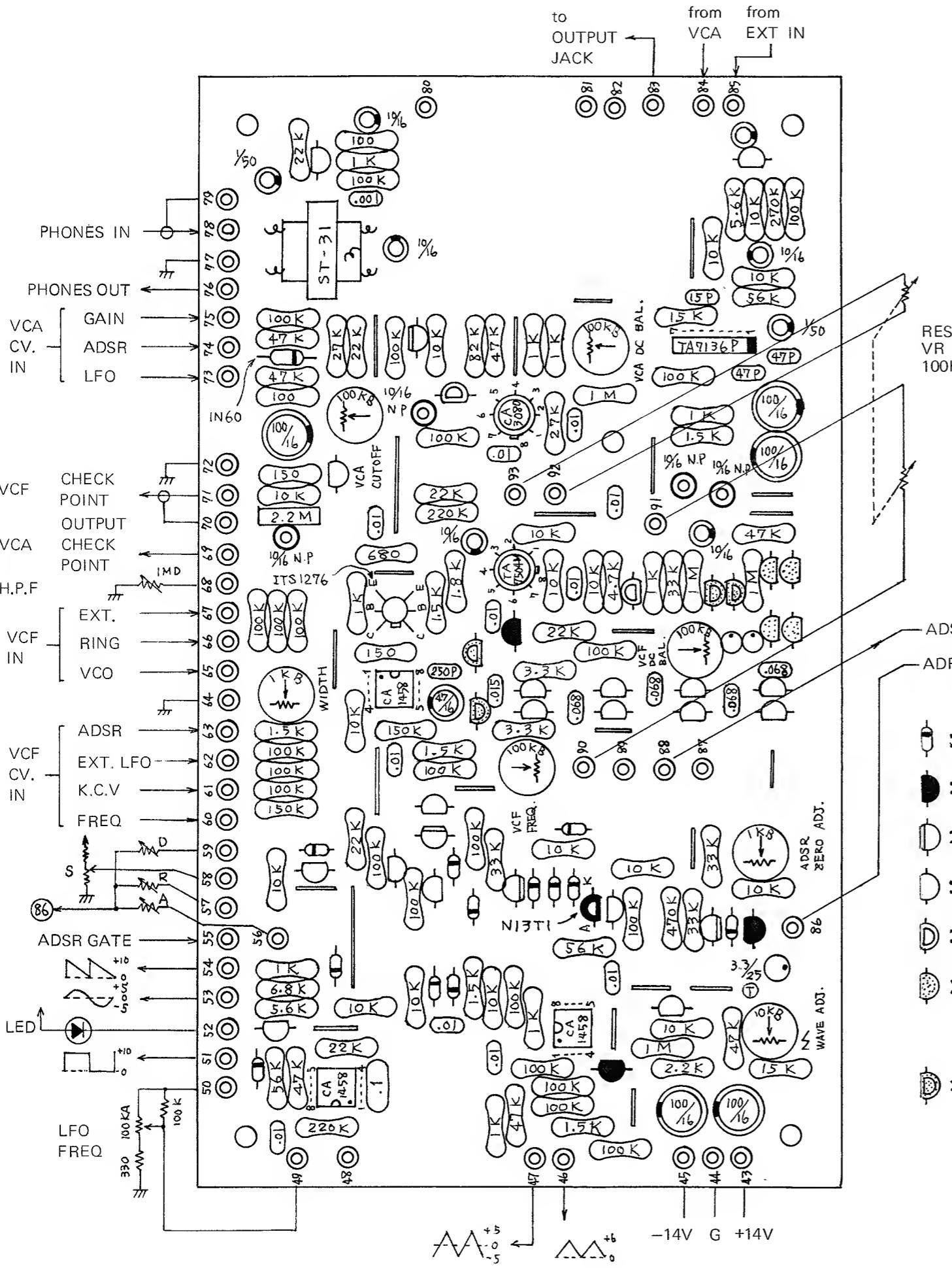
• 2SA733 (

D ; 2SC945 (

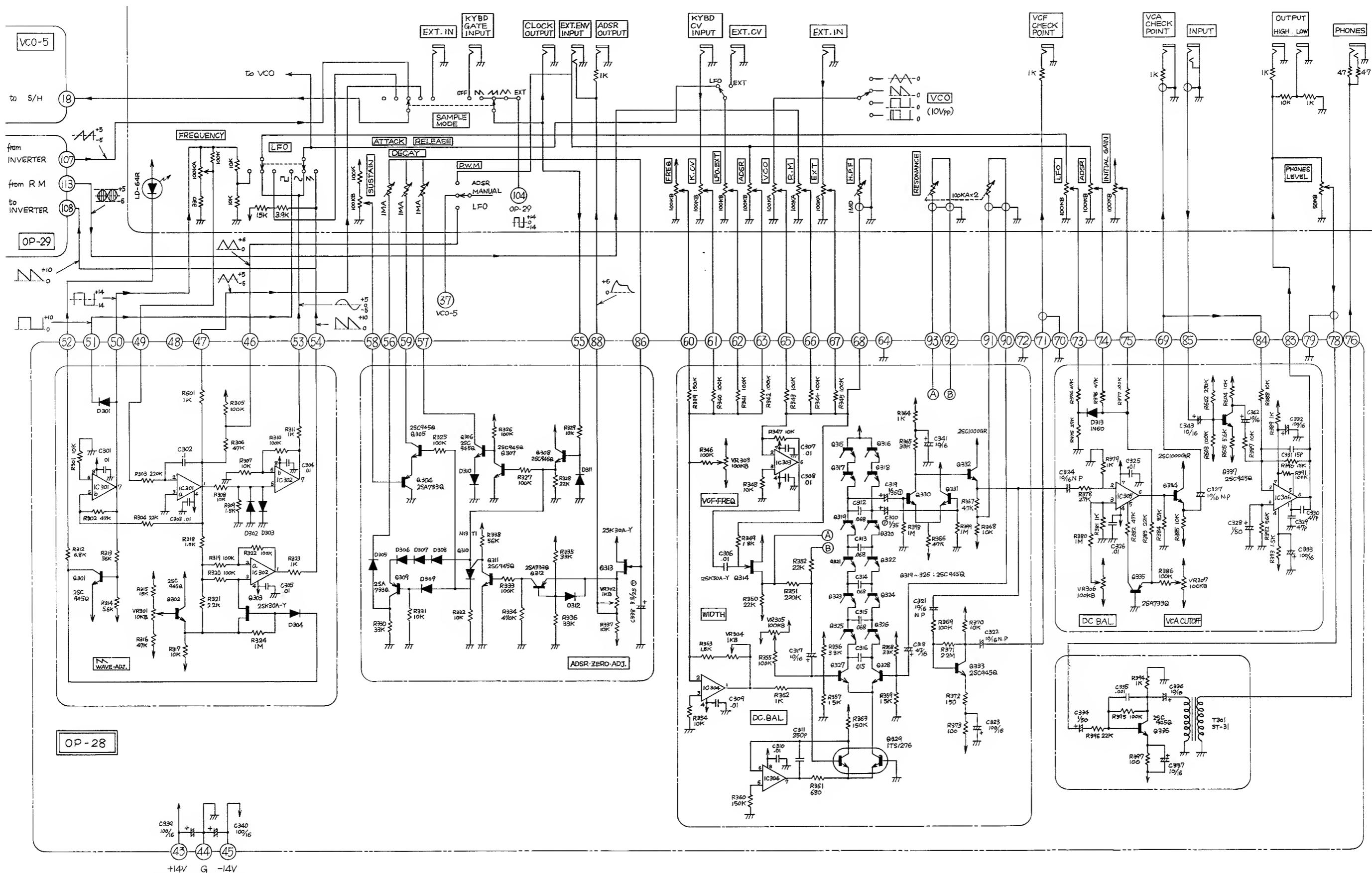
VCO-5 VCO BOARD CIRCUIT DIAGRAM



OP-28 VCF·VCA BOARD ASSEMBLY PARTS LAYOUT (149-028)



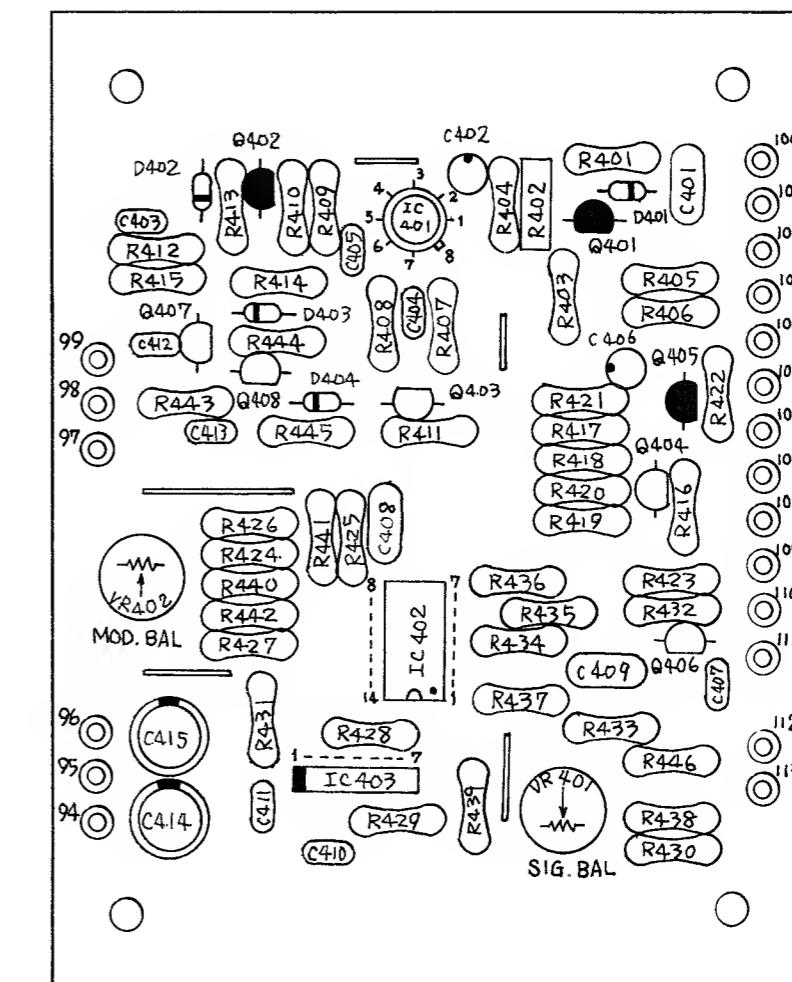
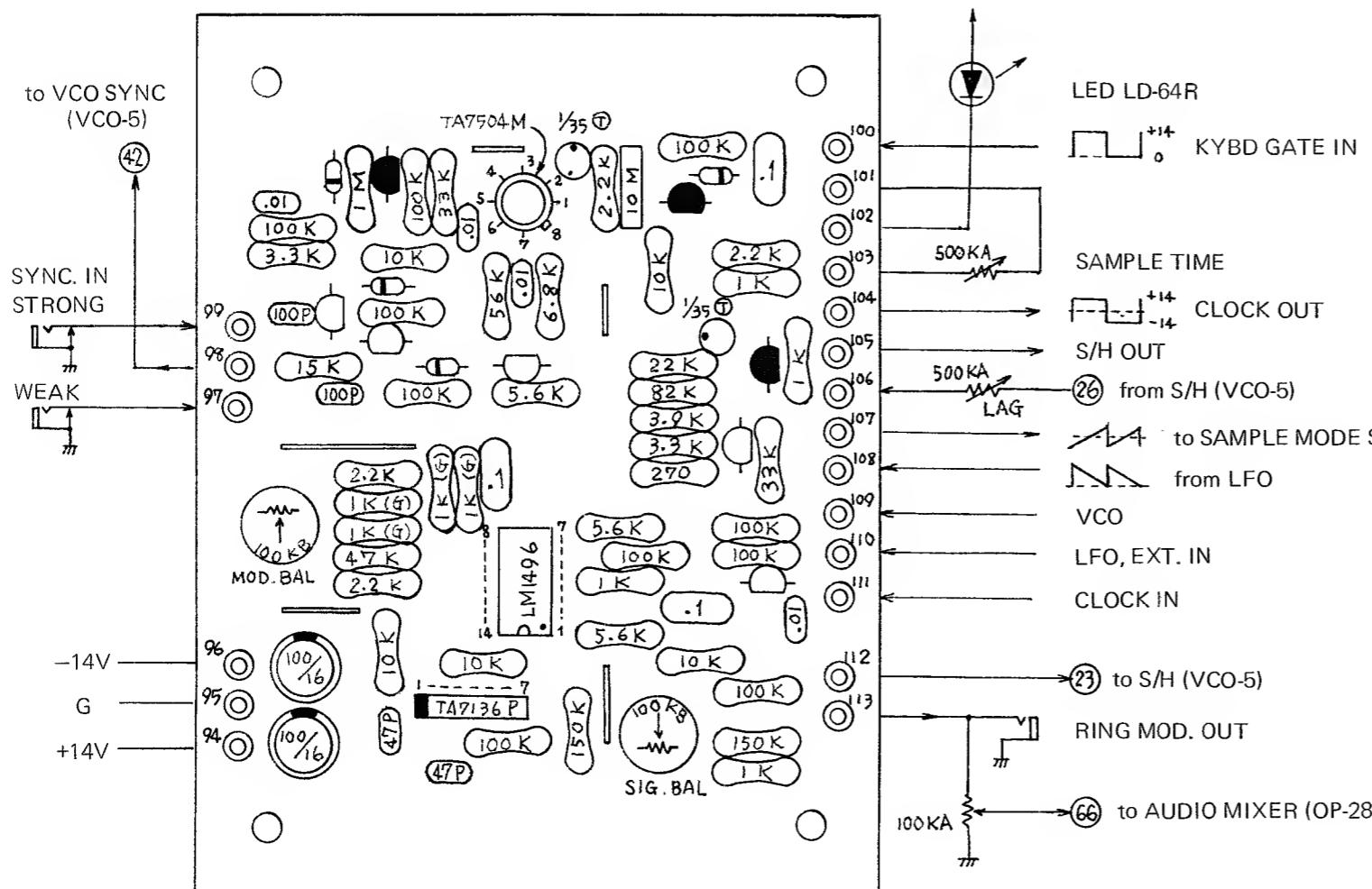
OP-28 VCF·VCA BOARD CIRCUIT DIAGRAM



NOTES: Q315-318 2SC945Q (SELECTED VCF)
Q327, 328, 330, 331 2SC1000GR (SELECTED hfe)
IC301, 302, 304 CA1458G
IC303 TA7504M
IC305 CA3080 (SELECTED C)
IC306 TA7136P

① : Tantalum Capacitor
ALL DIODES ARE 1S2473
UNLESS OTHERWISE SPECIFIED

OP-29 RING BOARD ASSEMBLY PARTS LAYOUT (149-029)



1S2473

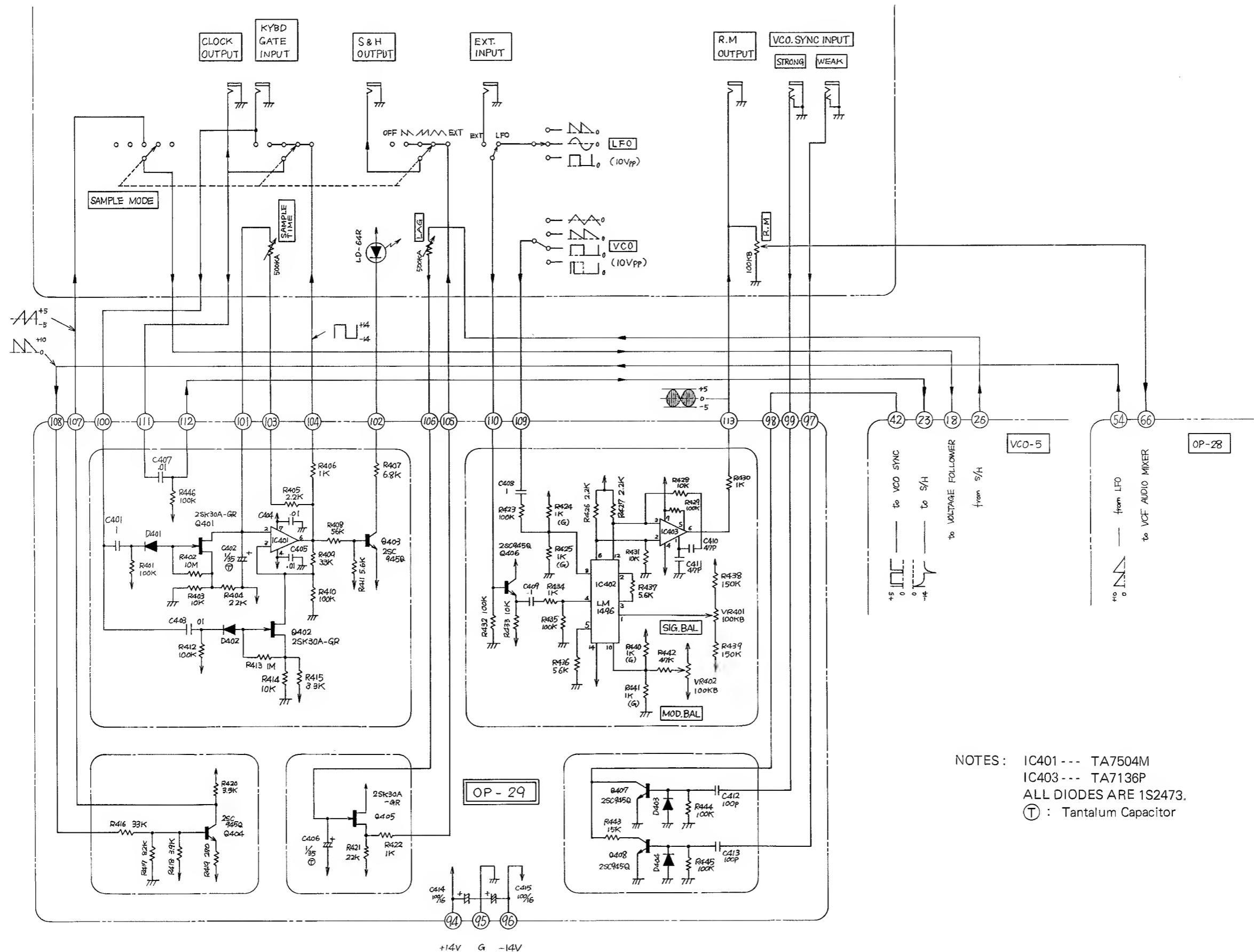
Tantalum Capacitor

2SK30A (GR)

1/4R ± 2%

2SC945 (Q)

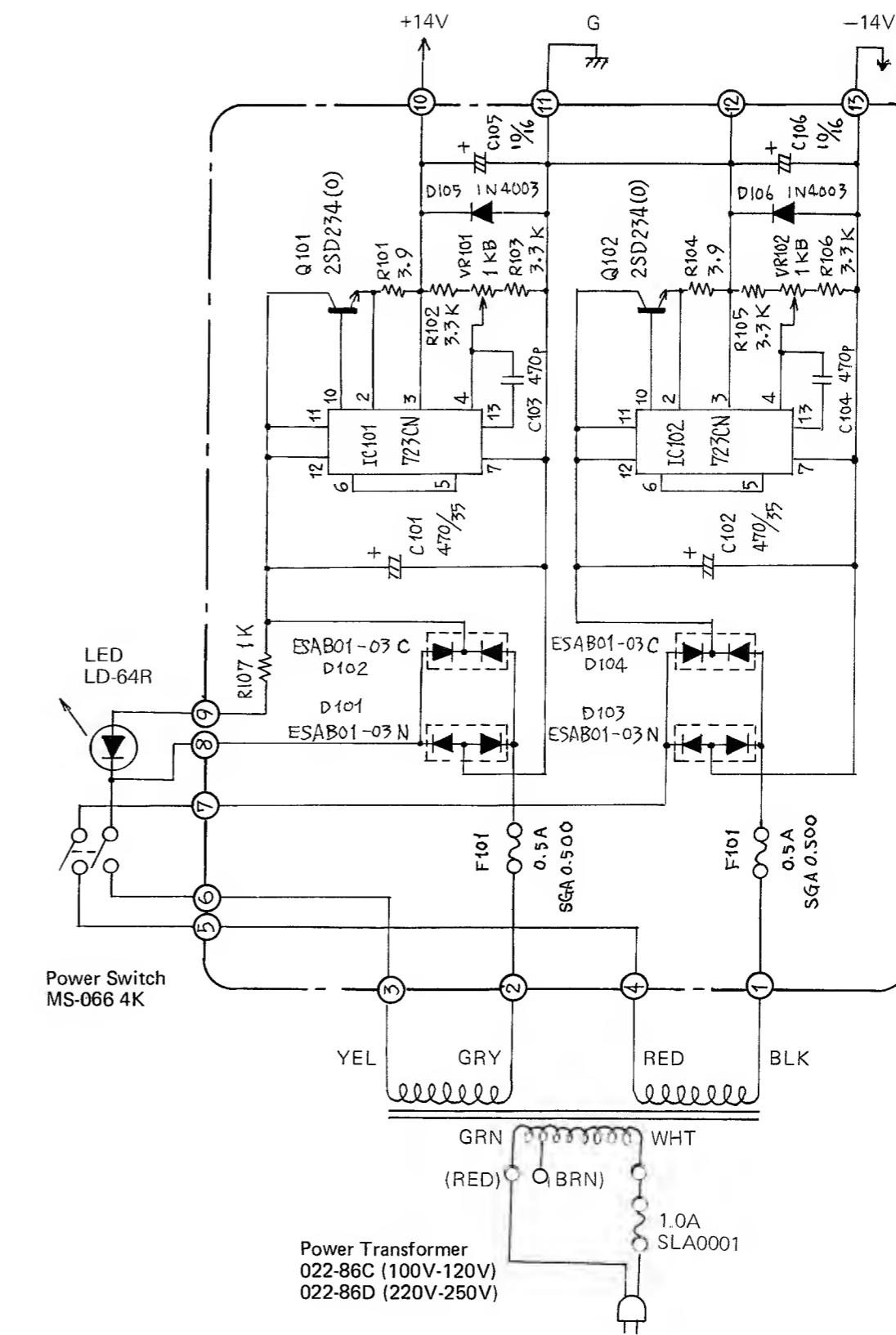
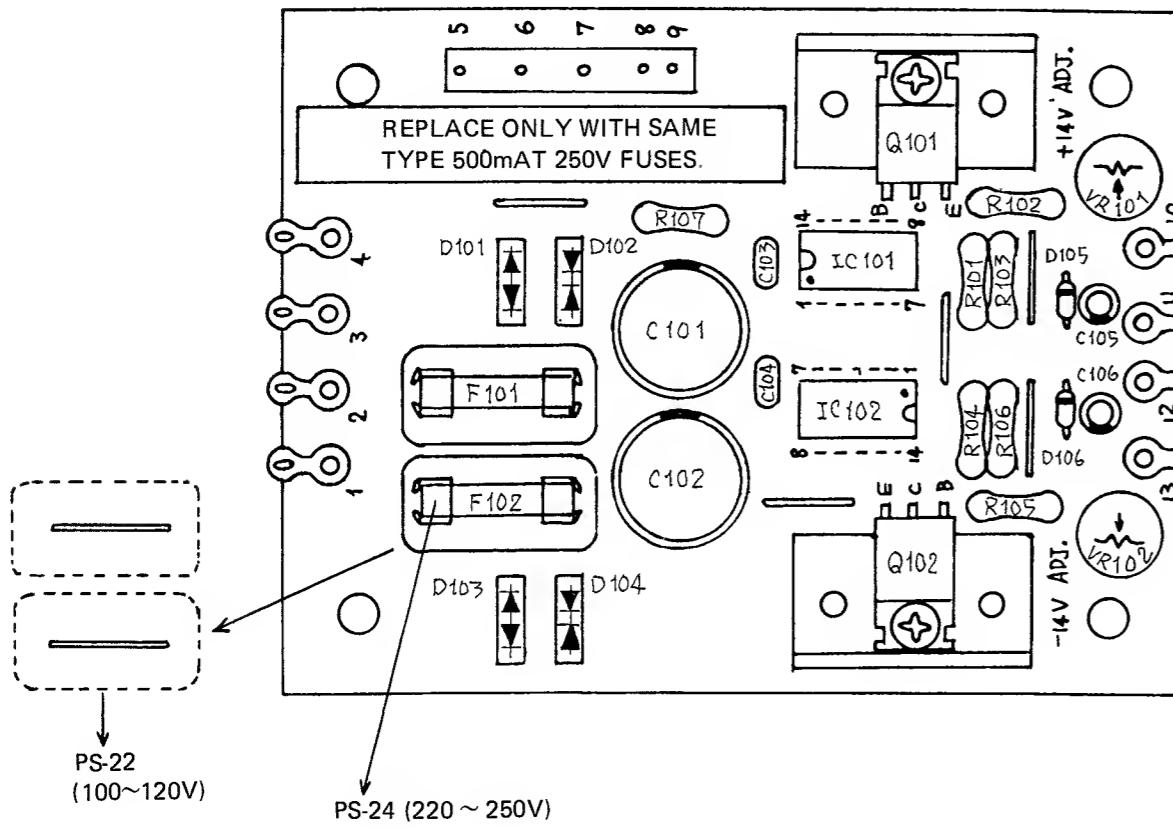
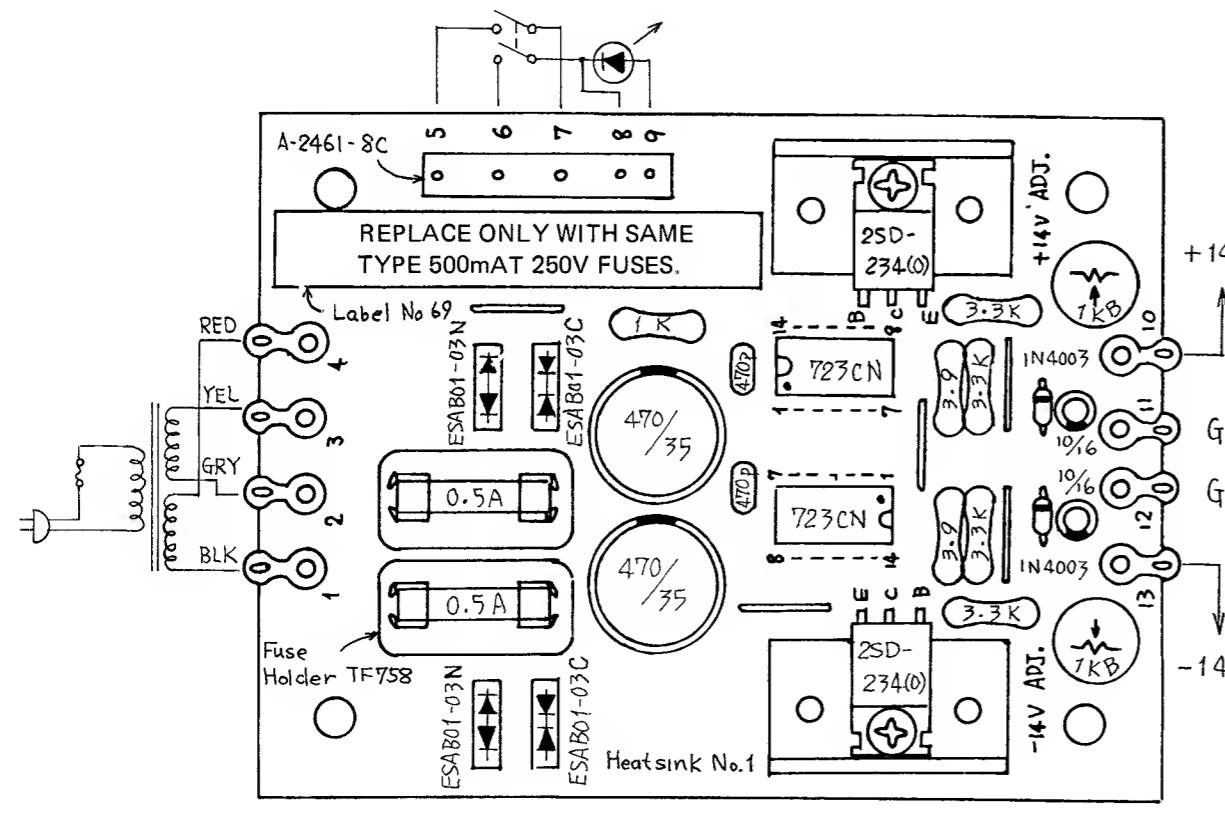
OP-29 RING BOARD CIRCUIT DIAGRAM



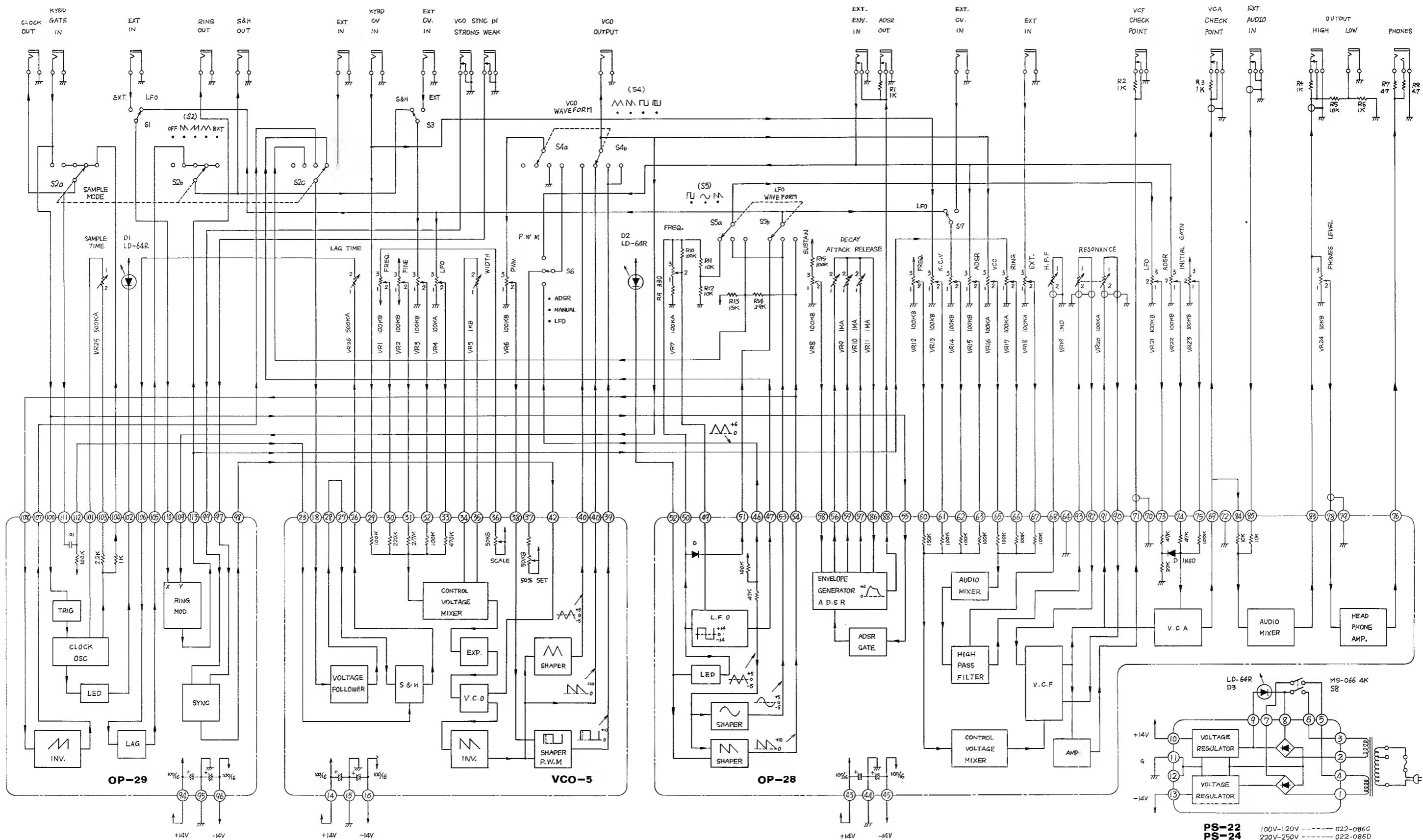
NOTES :
 IC401 --- TA7504M
 IC403 --- TA7136P
 ALL DIODES ARE 1S2473.
 (T) : Tantalum Capacitor

PS-22 PS-24 Power Supply Board Assy Parts Layout

Circuit Diagram



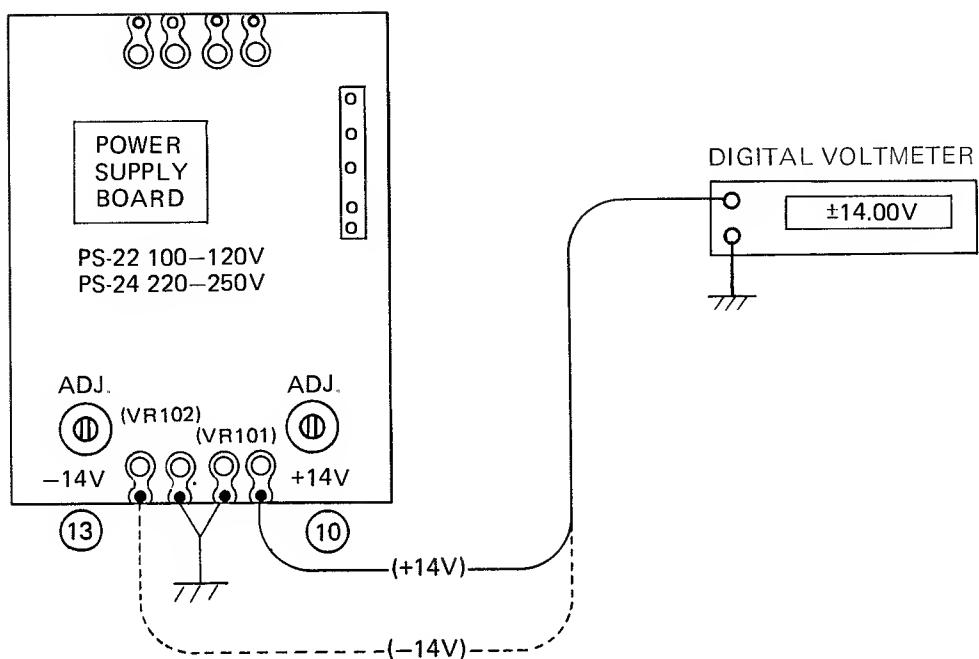
WIRING DIAGRAM

PS-22
PS-24100V-120V ----- 022-086C
220V-250V ----- 022-086D

SYSTEM 100, MODEL 102 ADJUSTMENT PROCEDURES

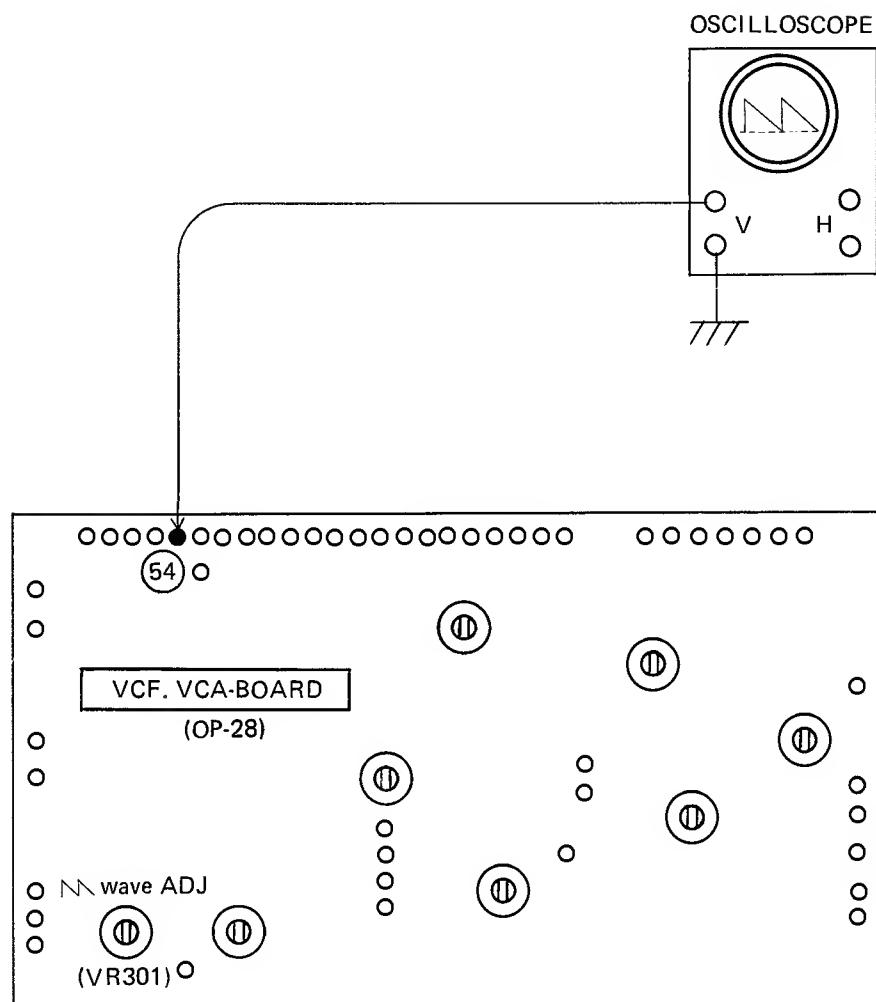
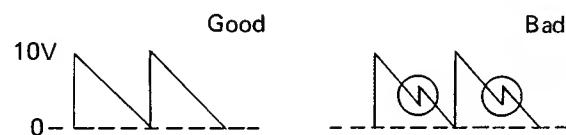
1. Power supply Voltage Adjustment:

- a) Connect 2 Digital Voltmeter to Terminal "10" of the Power Circuit Board (PS-22, PS-24), and adjust VR101 (+14V ADJ.) for +14V
- b) Adjust VR102 (-14V ADJ.) for -14V at Terminal "13".
- c) Tolerance: $14V \pm 100 \text{ mV}$.
- d) Digital Voltmeter should have:
 - Resolution voltage down to DC 10 mV or more
 - Input Impedance 1 Mohm or more



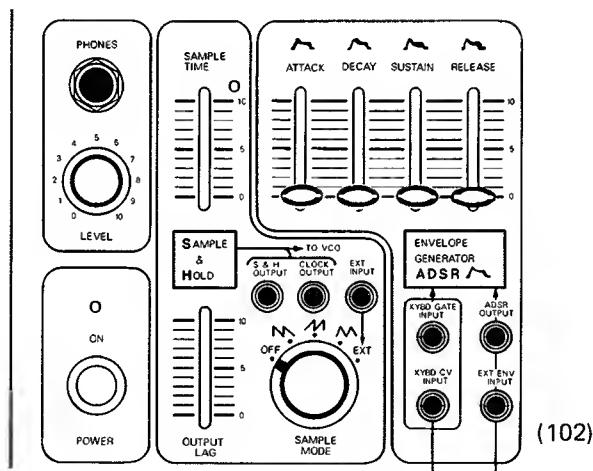
LFO Waveform Adjustment:

a) Connect the Oscilloscope to Terminal "54" of the VCF-VCA Board (OP-28), and adjust VR301 (\triangle wave ADJ.) for a Sawtooth wave.

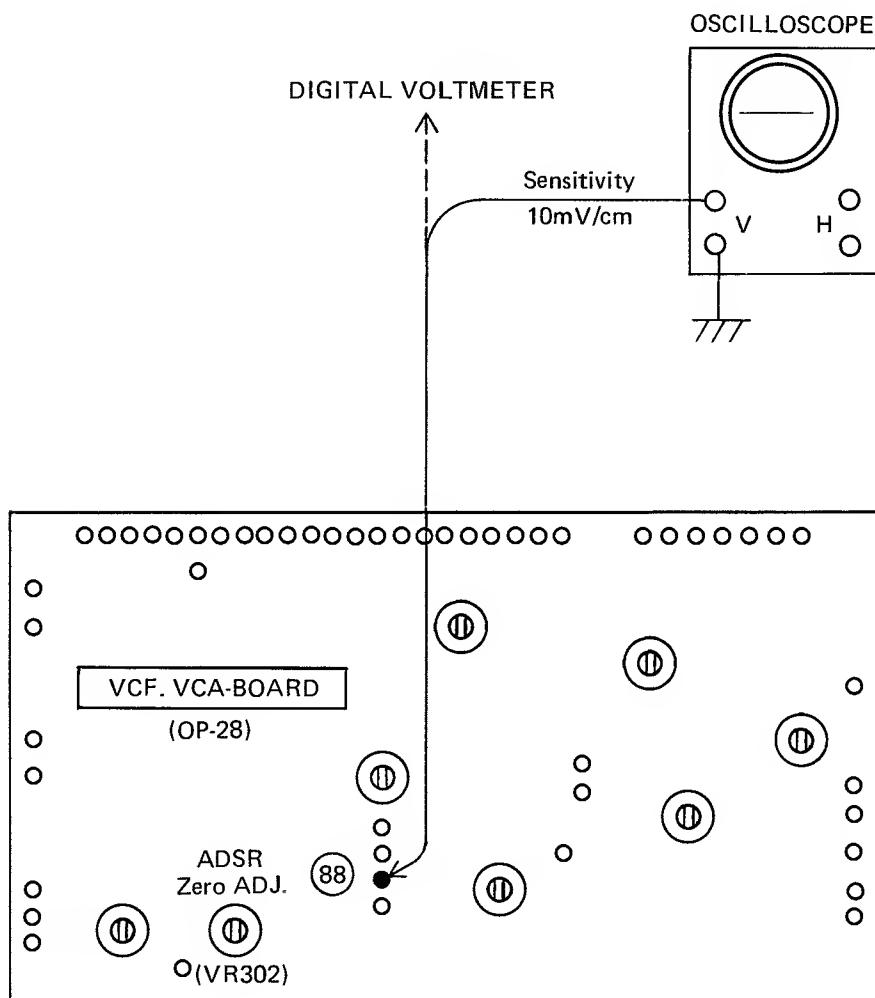


ADSR Zero Adjustment:

a) Set the controls of the Control Panel as illustrated below:

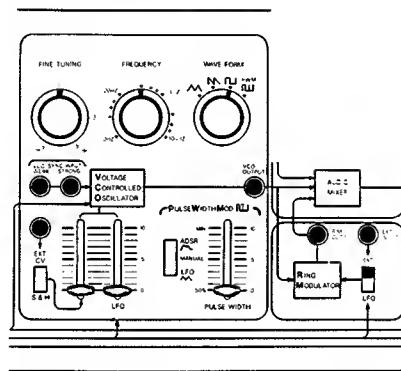


b) Connect an Oscilloscope or Digital Voltmeter to Terminal "88" or the ADSR OUTPUT JACK and adjust VR302 (ADSR Zero ADJ.) for 0V.



RING MOD Adjustment:

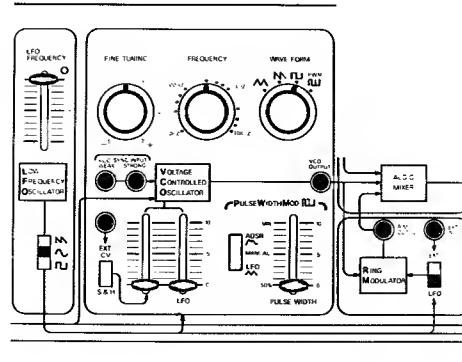
a) Set the controls of the control panel as illustrated below:



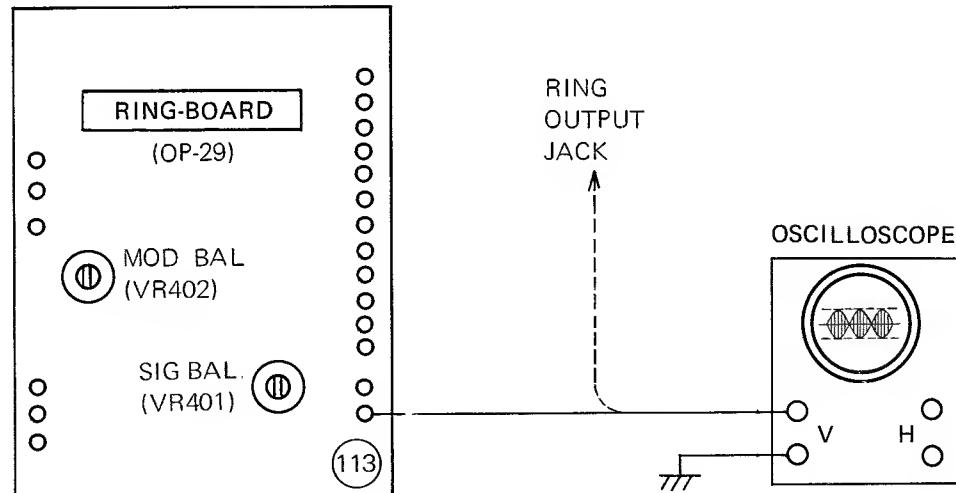
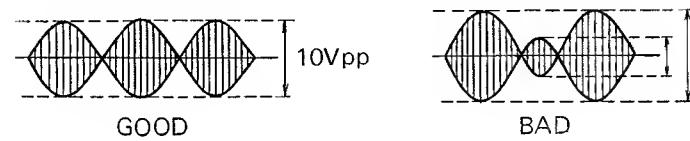
b) Connect the Oscilloscope to terminal "113" or the RING OUTPUT jack and adjust VR-401 (SIG BAL) for minimum output.

c) Allowable voltage limit; under 100 mV

d) Reset the controls as illustrated below:



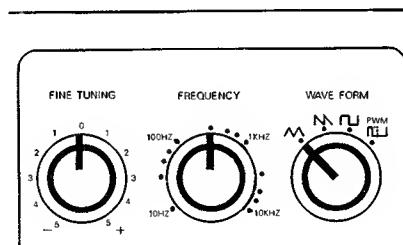
e) Adjust VR-402 (MOD BAL) for uniform waveform and amplitude.



VCO ADJUSTMENT

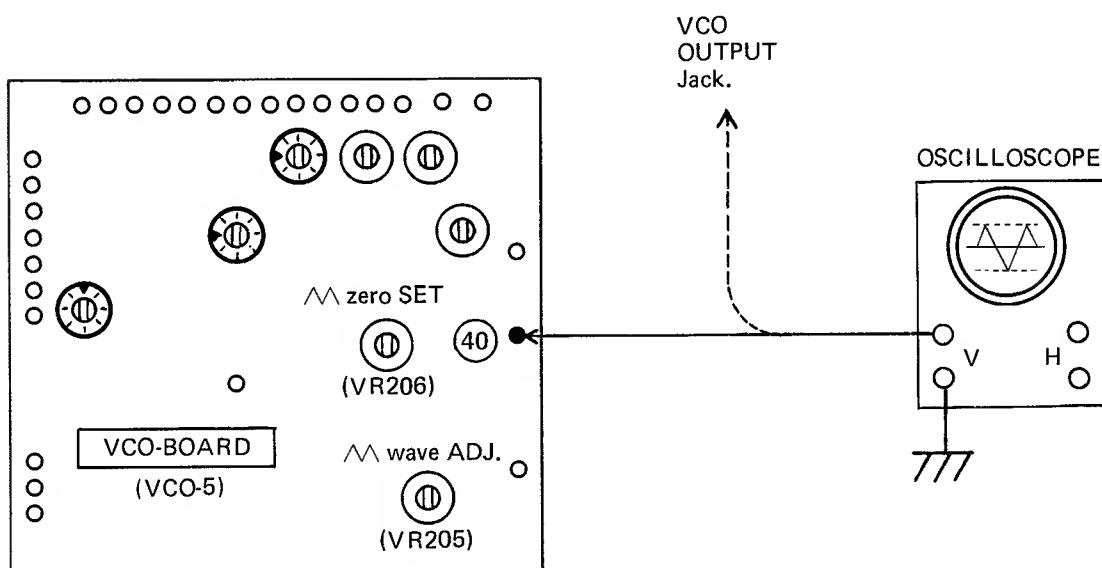
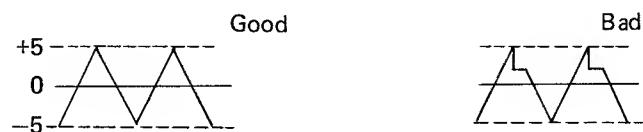
1. Triangular ($\wedge\wedge$) Wave Form Adjustment:

a) Set the Control Panel as shown below.



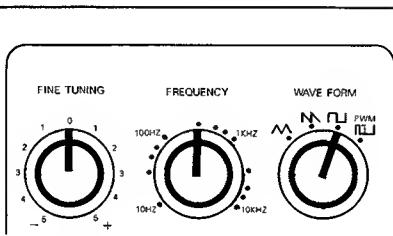
b) Connect the Oscilloscope to Terminal "40" or the VCO OUTPUT JACK, and adjust VR205 ($\wedge\wedge$ WAVE ADJ.) for the triangular waveform.

c) Then, adjust VR206 ($\wedge\wedge$ ZERO SET) so as to balance this output waveform on 0V.



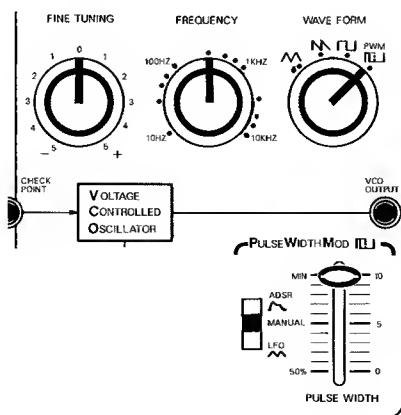
2. Square (□) Wave Adjustment:

a) Set the Control Panel as shown below.



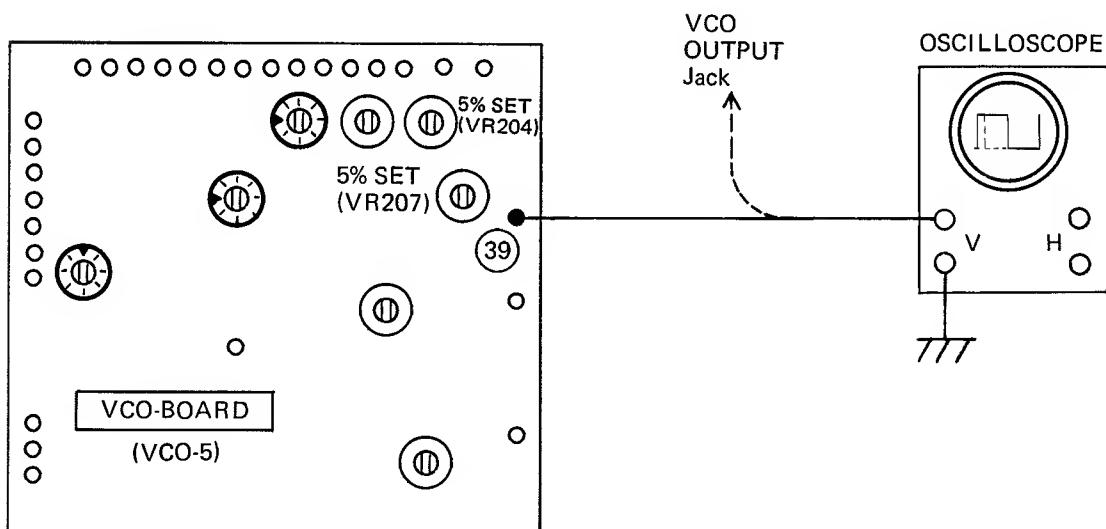
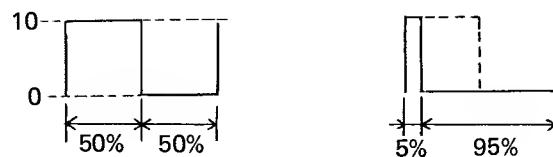
b) Connect the Oscilloscope to Terminal "39" or the VCO OUTPUT JACK on the VCO Board (VCO-5), and adjust VR207 (□ 50% SET) for a 50% – 50% square wave.

c) Re-set the Control Panel as shown below.



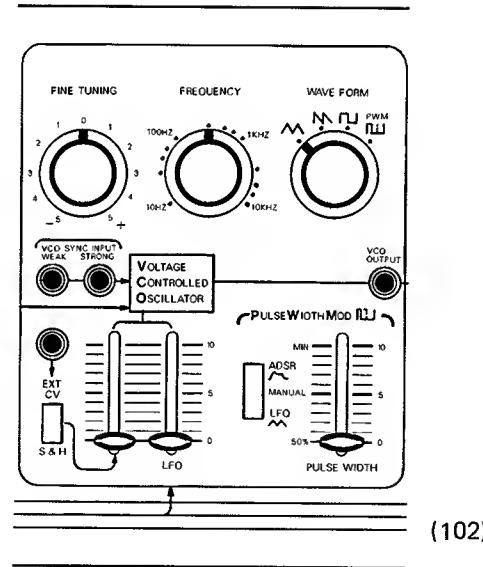
d) With the same connection as in b) above, adjust VR204 (□ 5% SET) for a 5% – 95% square wave.

e) Check that the wave form does not disappear when the front panel FREQUENCY control is turned from 10 Hz to 10 KHz.



3. VCO WIDTH Adjustment:

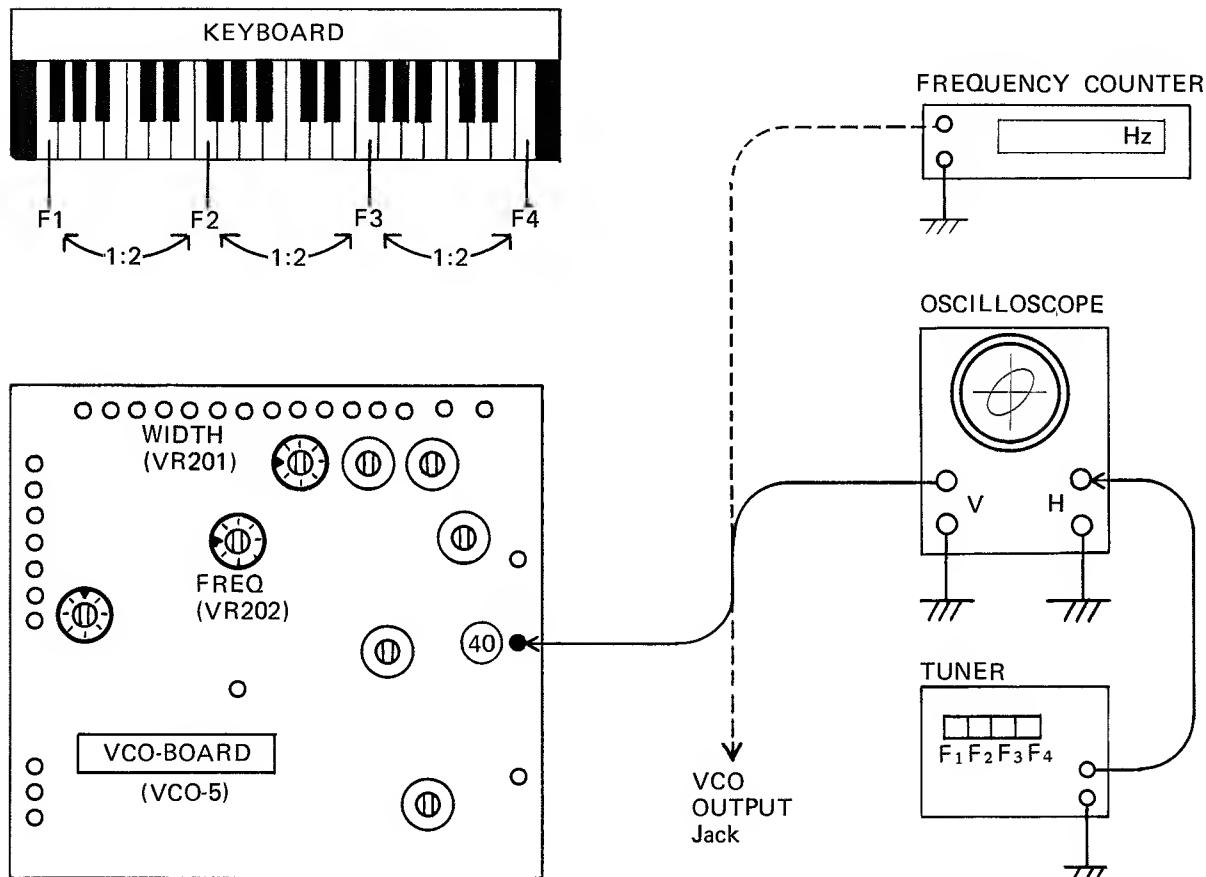
a) Set the Control Panel as shown below.



(102)

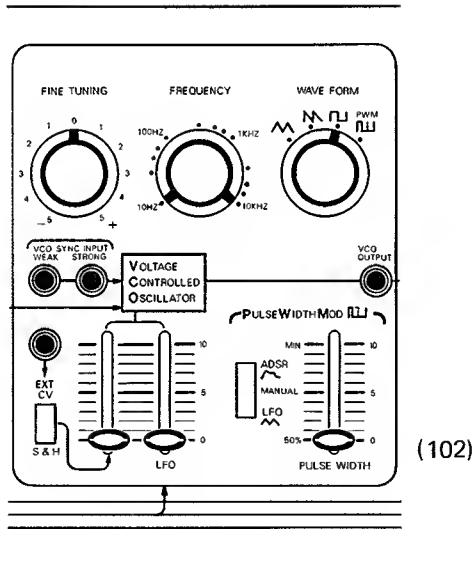
b) Connect the Oscilloscope or Frequency Counter to Terminal "40" or the VCO OUTPUT JACK, and adjust VR201 (WIDTH) so that the frequency generations on Keys F1, F2, F3, and F4, become all octave relations with each other.

c) When tuned with a Tuner, use VR202 (FREQ.) for adjustment of the frequency of Key F1.



4. VCO FREQ. Adjustment:

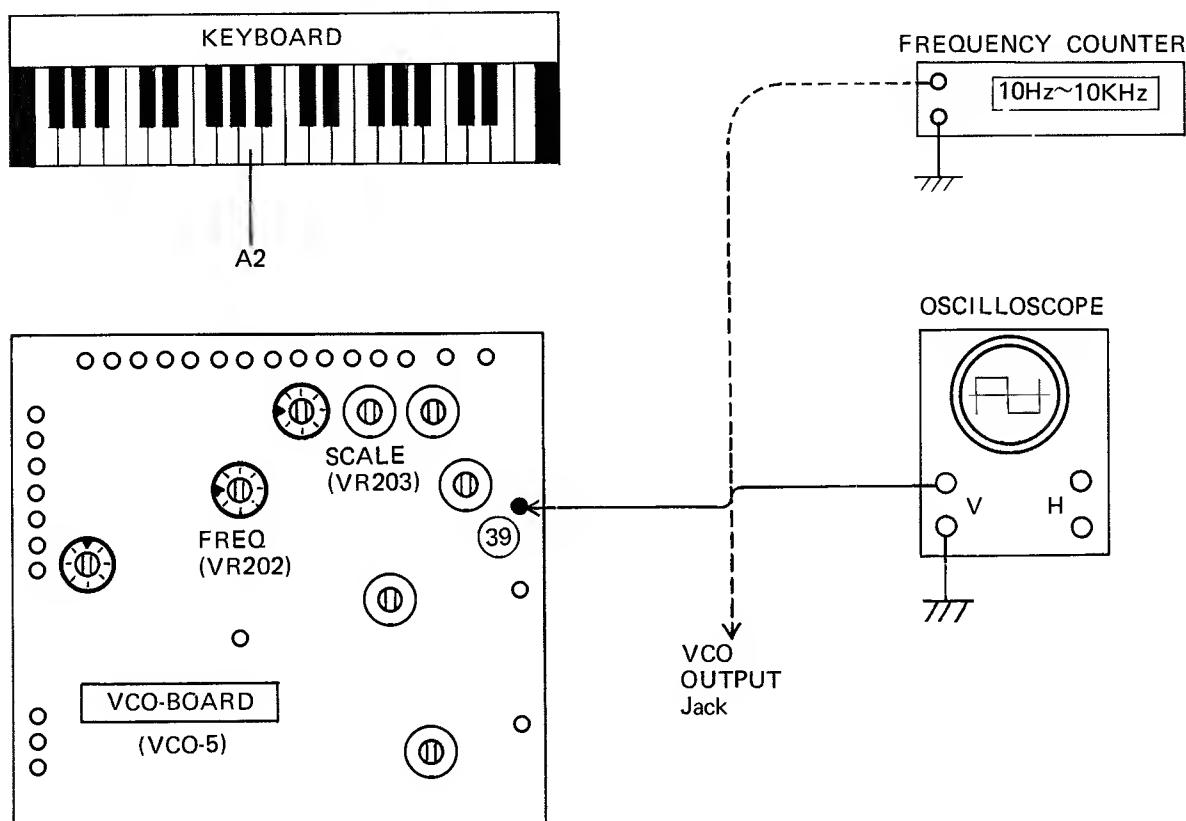
a) Set the Control Panel as shown below.



b) Connect the Oscilloscope or Frequency Counter to Terminal "39" or the VCO OUTPUT JACK. With the front panel FREQUENCY control set at "10Hz", adjust VR202 (FREQ) so that the A2 key on the keyboard produces 10Hz (100ms).

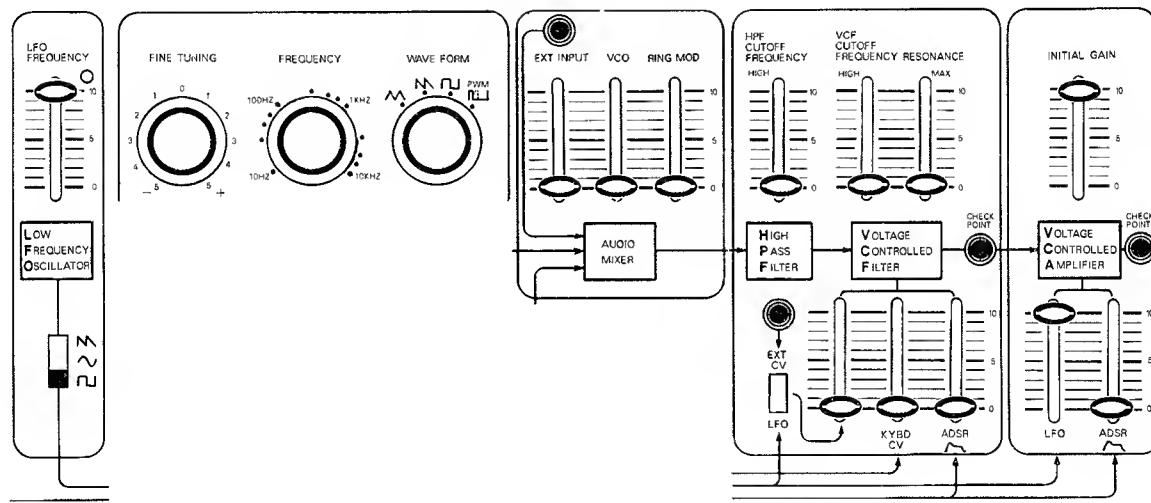
c) In the same manner, adjust VR203 (SCALE) so as to have 10 KHz (100 μ s) when the FREQUENCY control is at "10 KHz".

d) Repeat the above b) and c) until the frequency output matches the "10 Hz" and "10 KHz" indications)

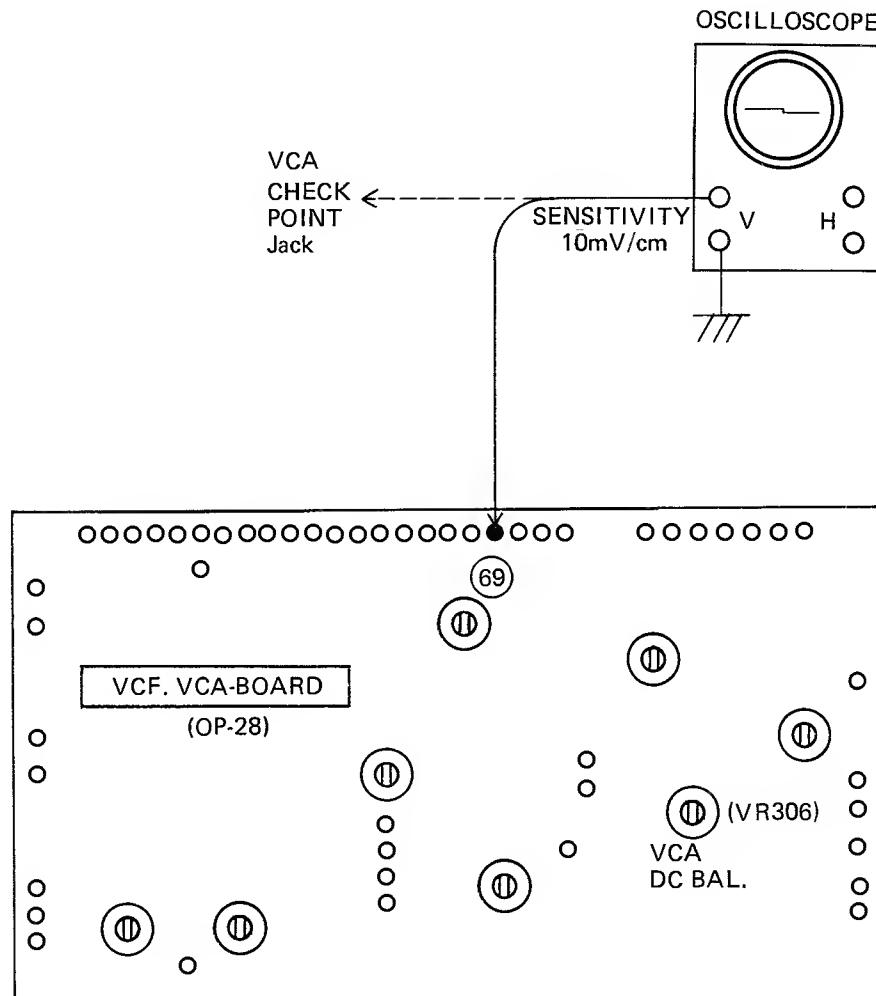


2. VCA DC BAL Adjustment:

a) Set the Control Panel as shown below.



b) Connect the Oscilloscope to Terminal "69" or VCA CHECK POINT JACK on the VCF VCA Board (OP-28), and adjust VR306 (VCA DC BAL) for minimum "click" at the output.



SYSTEM-100 MODEL-102 PARTS LIST

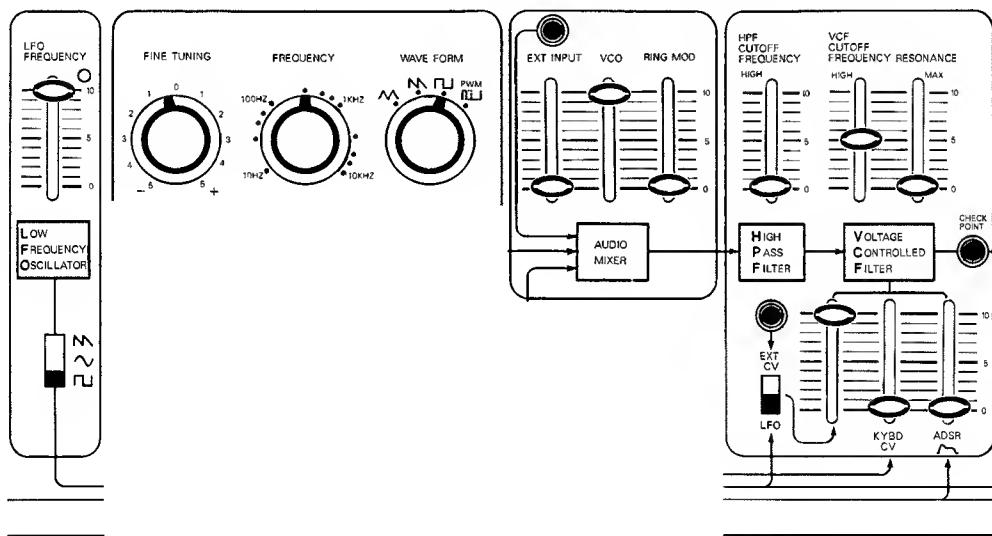
VCO-5 VCO Board Assembly (152-005)

052-134C	Printed Circuit Board No. 134C				
020-025	IC	CA3130			
020-024	IC	301AH			
020-052	IC	CA1458G			
020-010	IC	TA7504M			
020-032	IC	uA726			
017-013	Transistor	2SC945 (Q)			
017-012	Transistor	2SA733 (Q)			
017-016	FET	2SK30A (GR)			
017-036	FET	E412 (17S30546)			
018-014	Diode	1S2473			
028-006	Trimmer Potentiometer	50KΩ (B)	EVL-R4XA0054B		
028-007	Trimmer Potentiometer	100KΩ (B)	EVL-R4XA0015B		
029-108	Trimmer Potentiometer	50KΩ (B)	PNB-04C3A-503H		
029-109	Trimmer Potentiometer	100KΩ (B)	PNB-04C3A-104H		
044-025	Resistor	100Ω	1/4W	± 5%	
044-031	Resistor	330Ω	1/4W	± 5%	
044-037	Resistor	1KΩ	1/4W	± 5%	
044-041	Resistor	2.7KΩ	1/4W	± 5%	
044-042	Resistor	3.3KΩ	1/4W	± 5%	
044-047	Resistor	8.2KΩ	1/4W	± 5%	
044-048	Resistor	10KΩ	1/4W	± 5%	
044-050	Resistor	15KΩ	1/4W	± 5%	
044-052	Resistor	22KΩ	1/4W	± 5%	
044-054	Resistor	33KΩ	1/4W	± 5%	
044-055	Resistor	39KΩ	1/4W	± 5%	
044-057	Resistor	56KΩ	1/4W	± 5%	
044-058	Resistor	68KΩ	1/4W	± 5%	
044-060	Resistor	100KΩ	1/4W	± 5%	
044-082	Resistor	200KΩ	1/4W	± 5%	
044-064	Resistor	220KΩ	1/4W	± 5%	
044-066	Resistor	330KΩ	1/4W	± 5%	
044-068	Resistor	470KΩ	1/4W	± 5%	
044-072	Resistor	1MΩ	1/4W	± 5%	
044-167	Resistor	2.7MΩ	1/2W	± 10%	
044-599	Resistor	10MΩ	1/2W	± 10%	
044-829	Resistor	820Ω	CRB-1/4FX	± 10%	
044-840	Resistor	22KΩ	CRB-1/4FX	± 10%	
044-845	Resistor	82KΩ	CRB-1/4FX	± 10%	
044-846	Resistor	100KΩ	CRB-1/4FX	± 10%	
044-847	Resistor	120KΩ	CRB-1/4FX	± 10%	
037-001	Capacitor	10pF	50V	± 10%	Ceramic
037-006	Capacitor	100pF	50V	± 10%	Ceramic
035-005	Capacitor	0.001μF	50V	± 10%	Mylar
035-016	Capacitor	0.01μF	50V	± 10%	Mylar
035-026	Capacitor	0.068μF	50V	± 10%	Mylar
035-028	Capacitor	0.1μF	50V	± 10%	Mylar
035-137	Capacitor	1000pF	100V	± 10%	Polystyrene
032-033	Capacitor	10μF	16V	±	Electrolytic
032-037	Capacitor	100μF	16V	±	Electrolytic

VCF ADJUSTMENT

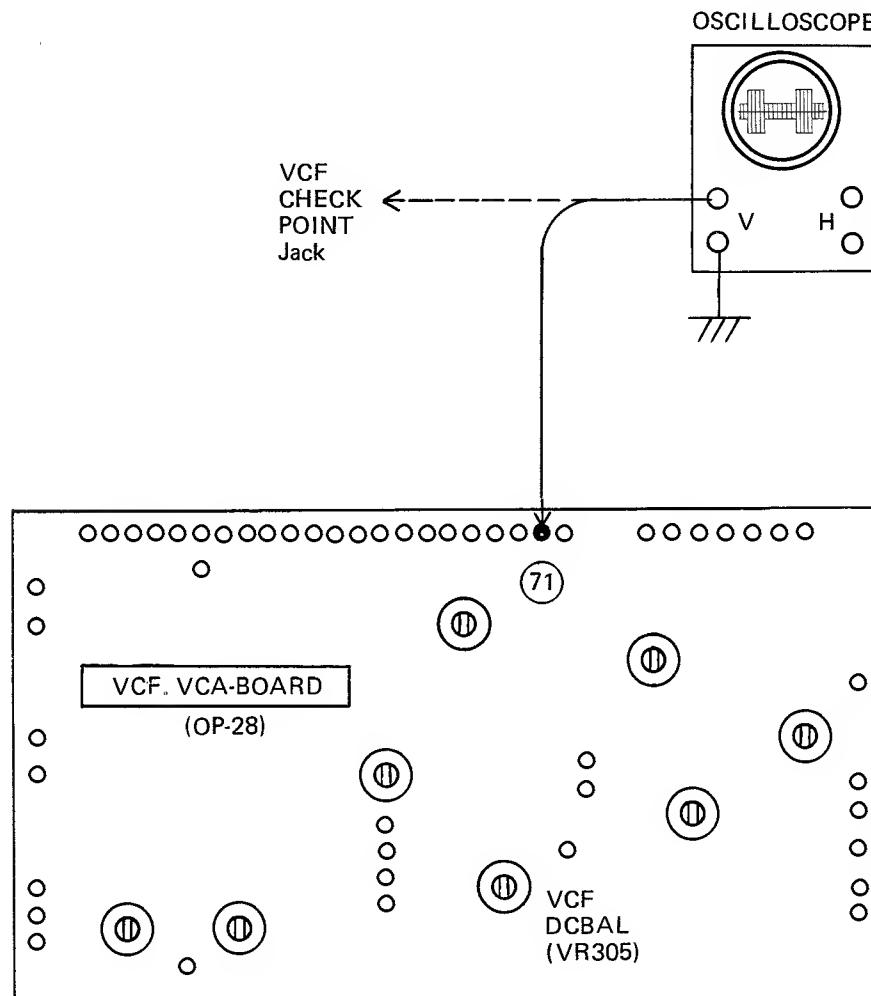
1. VCF DC BAL Adjustment:

a) Set the Control Panel as shown below.



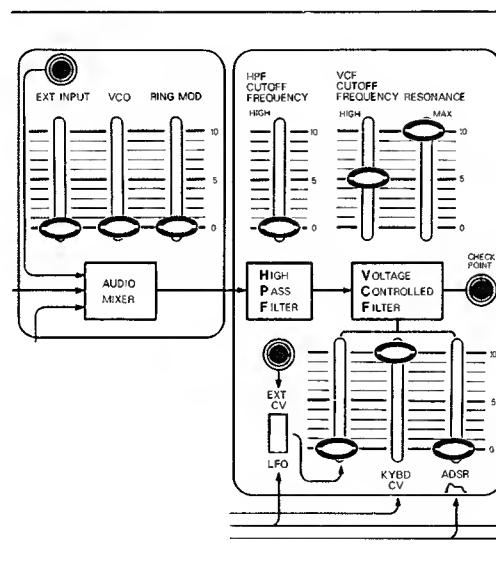
b) Connect the Oscilloscope to Terminal "71" or the VCF CHECK POINT JACK on the VCF VCA Board, and adjust VR305 (VCF DC BAL) so the output waveform is symmetrical.

c) Check that waveform remains balanced when the CUTOFF-FREQ. control is moved between 10 and 0.



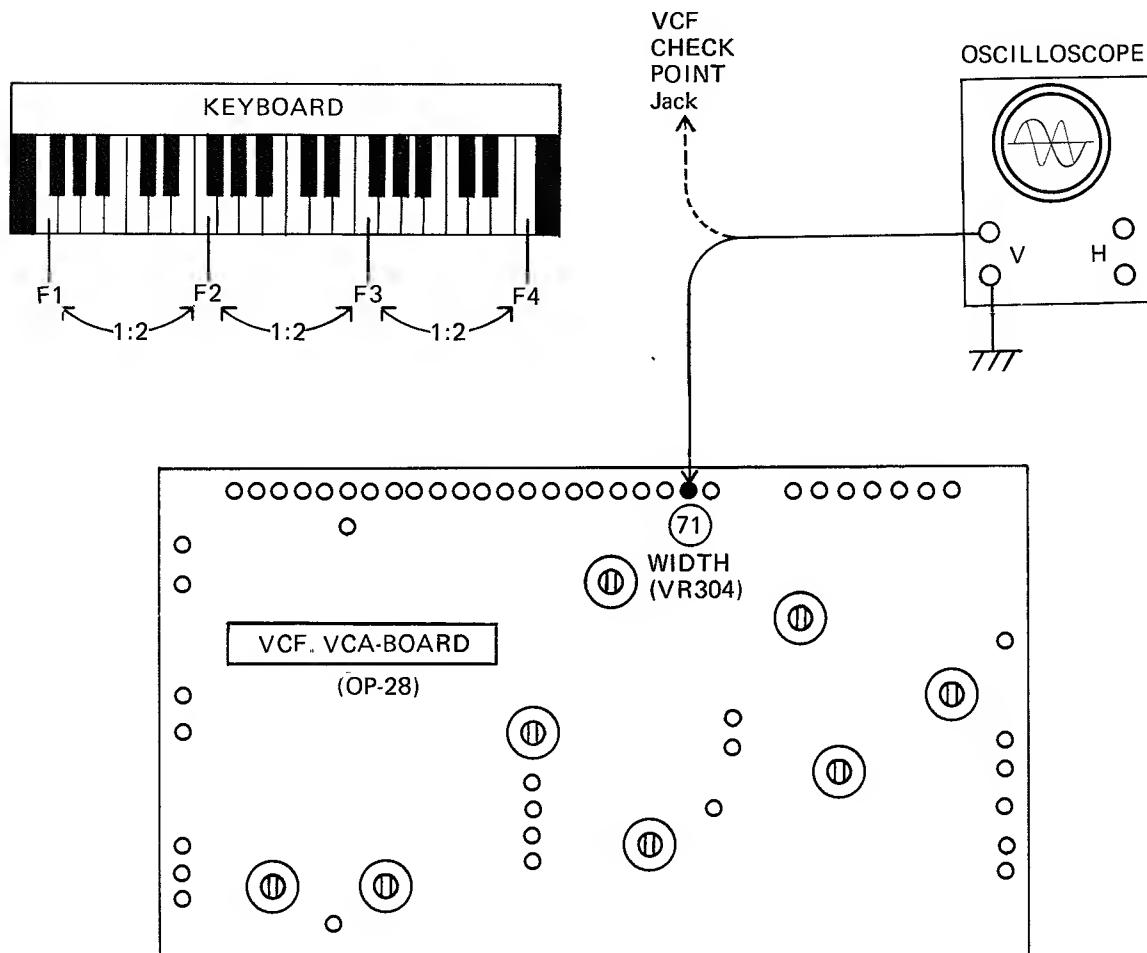
2. VCF WIDTH Adjustment:

a) Set the Control Panel as shown below.



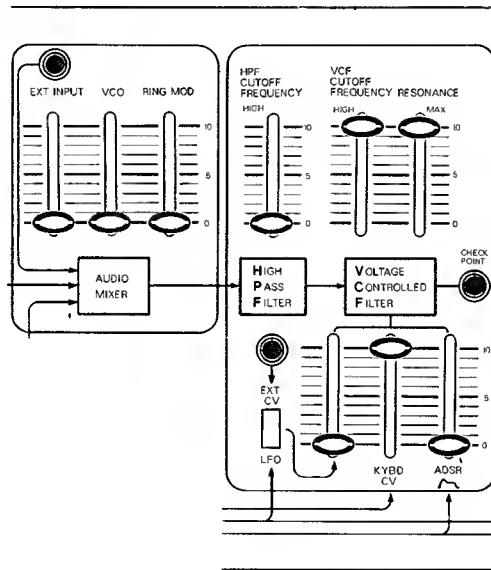
b) Connect the Oscilloscope to Terminal "71" or the VCF CHECK POINT JACK, and adjust VR304 (WIDTH) so that the frequency generations of Keys F1, F2, F3, and F4, are all in octave relationships with each other.

d) Check that such octave relations remain the same when the front panel CUTOFF FREQ. control is moved between 10 and 0.



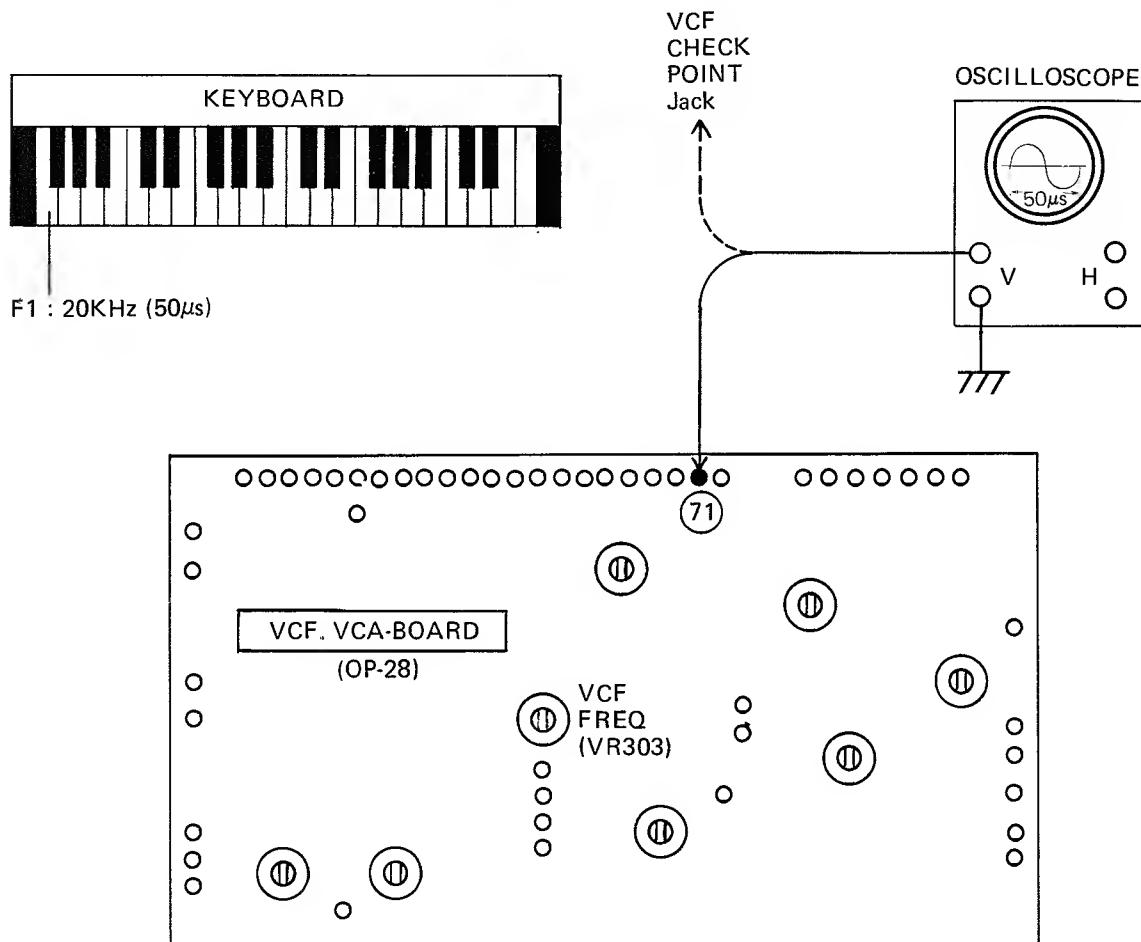
3. VCF FREQ. Adjustment:

a) Set the Control Panel as shown below.



b) Connect the Oscilloscope to Terminal "71" or the VCF CHECK POINT JACK on the VCF-VCA Board (OP-28), and adjust VR303 (VCF-FREQ.) so the frequency produced by Key F1 is 20 KHz ($50\mu s$)

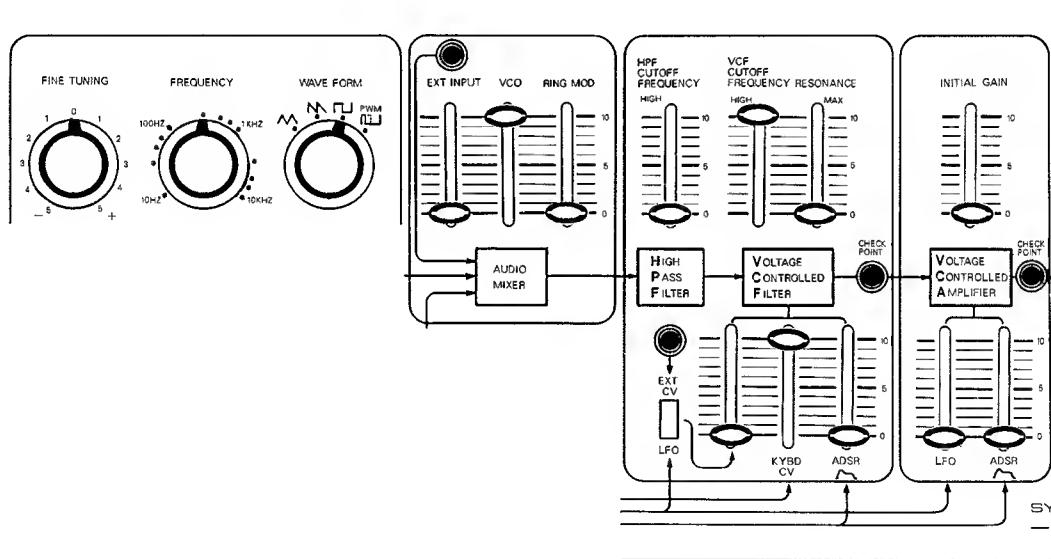
c) Adjustment as above may sometimes disturb the VCF WIDTH Adjustment as done in (2) above. Repeat, therefore, both adjustments of (2) and (3) until both WIDTH and FREQ. are correct.



VCA ADJUSTMENT

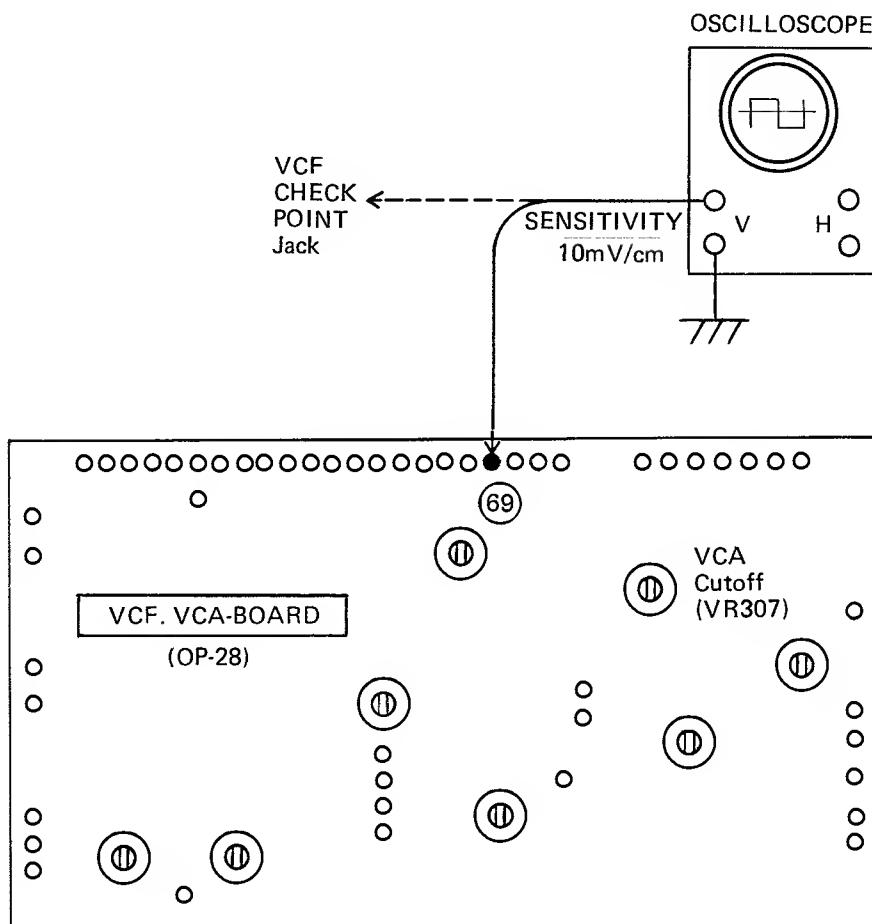
1. VCA CUTOFF Adjustment:

a) Set the Control Panel as shown below.



b) Connect the Oscilloscope to Terminal "69" or the VCA CHECK POINT JACK on the VCF VCA Board (OP-28), and set VR307 (VCA CUTOFF) at the point where the output wave form just disappears.

c) Check that, when the INITIAL GAIN on the Control Panel is moved to "10", the output voltage is within 2 – 3 Vp-p.



OP-28 VCF-VCA Board Assembly (149-028)

05 052-135A	Printed Circuit Board No. 135A			
020-052	IC	CA1458G		
020-015	IC	CA3080	Selected VCA	
020-010	IC	TA7504M		
020-027	IC	TA7136P		
020-021	IC	ITS1276		
017-013	Transistor	2SC945 (Q)		
017-047	Transistor	2SC945 (Q)	Selected VCF	
017-003	Transistor	2SC1000 (GR)		
017-048	Transistor	2SC1000 (GR)	Selected hfe	
017-012	Transistor	2SA733 (Q)		
017-014	FET	2SK30A (Y)		
017-018	PUT	N13T1		
018-014	Diode	1S2473		
018-027	Diode	1N60		
022-077	Output Transformer	ST-31		
028-002	Trimmer Potentiometer	1KΩ (B)	EVL-R4XA0013B	
028-004	Trimmer Potentiometer	10KΩ (B)	EVL-R4XA0014B	
028-007	Trimmer Potentiometer	100KΩ (B)	EVL-R4XA0015B	
044-025	Resistor	100Ω	1/4W	± 5%
044-027	Resistor	150Ω	1/4W	± 5%
044-035	Resistor	680Ω	1/4W	± 5%
044-037	Resistor	1KΩ	1/4W	± 5%
044-038	Resistor	1.5KΩ	1/4W	± 5%
044-039	Resistor	1.8KΩ	1/4W	± 5%
044-040	Resistor	2.2KΩ	1/4W	± 5%
044-042	Resistor	3.3KΩ	1/4W	± 5%
044-044	Resistor	4.7KΩ	1/4W	± 5%
044-045	Resistor	5.6KΩ	1/4W	± 5%
044-046	Resistor	6.8KΩ	1/4W	± 5%
044-048	Resistor	10KΩ	1/4W	± 5%
044-050	Resistor	15KΩ	1/4W	± 5%
044-052	Resistor	22KΩ	1/4W	± 5%
044-053	Resistor	27KΩ	1/4W	± 5%
044-054	Resistor	33KΩ	1/4W	± 5%
044-056	Resistor	47KΩ	1/4W	± 5%
044-057	Resistor	56KΩ	1/4W	± 5%
044-059	Resistor	82KΩ	1/4W	± 5%
044-060	Resistor	100KΩ	1/4W	± 5%
044-062	Resistor	150KΩ	1/4W	± 5%
044-064	Resistor	220KΩ	1/4W	± 5%
044-065	Resistor	270KΩ	1/4W	± 5%
044-068	Resistor	470KΩ	1/4W	± 5%
044-072	Resistor	1MΩ	1/4W	± 5%
044-166	Resistor	2.2MΩ	1/2W	± 10%
037-002	Capacitor	15pF	50V	± 10%
037-005	Capacitor	47pF	50V	± 10%
037-007	Capacitor	250pF	50V	± 10%
035-001	Capacitor	0.001μF	50V	± 10%
035-016	Capacitor	0.01μF	50V	± 10%
035-018	Capacitor	0.015μF	50V	± 10%
035-026	Capacitor	0.068μF	50V	± 10%
035-028	Capacitor	0.1μF	50V	± 10%
				Mylar
				Ceramic

032-099	Capacitor	1 μ F	35V	$\pm 10\%$	Tantalum
032-107	Capacitor	3.3 μ F	25V	$\pm 10\%$	Tantalum
032-071	Capacitor	1 μ F	50V		Electrolytic
032-033	Capacitor	10 μ F	16V		Electrolytic
032-036	Capacitor	47 μ F	16V		Electrolytic
032-037	Capacitor	10 μ F	16V		Non Polarized

OP-29 Ring Board Assembly (149-029)

052-136A	Printed Circuit Board No. 136A				
020-026	IC	LM1496			
020-010	IC	TA7504M			
020-027	IC	TA7136P			
017-013	Transistor	2SC945 (Q)			
017-014	FET	2SK30A (GR)			
018-014	Diode	1S2473			
028-007	Trimmer Potentiometer	100K Ω (B)	EVL-R4XA0015B		
044-030	Resistor	270 Ω	1/4W	$\pm 5\%$	
044-037	Resistor	1K Ω	1/4W	$\pm 5\%$	
044-040	Resistor	2.2K Ω	1/4W	$\pm 5\%$	
044-042	Resistor	3.3K Ω	1/4W	$\pm 5\%$	
044-043	Resistor	3.9K Ω	1/4W	$\pm 5\%$	
044-045	Resistor	5.6K Ω	1/4W	$\pm 5\%$	
044-046	Resistor	6.8K Ω	1/4W	$\pm 5\%$	
044-048	Resistor	10K Ω	1/4W	$\pm 5\%$	
044-049	Resistor	15K Ω	1/4W	$\pm 5\%$	
044-052	Resistor	22K Ω	1/4W	$\pm 5\%$	
044-054	Resistor	33K Ω	1/4W	$\pm 5\%$	
044-056	Resistor	47K Ω	1/4W	$\pm 5\%$	
044-057	Resistor	56K Ω	1/4W	$\pm 5\%$	
044-059	Resistor	82K Ω	1/4W	$\pm 5\%$	
044-060	Resistor	100K Ω	1/4W	$\pm 5\%$	
044-062	Resistor	150K Ω	1/4W	$\pm 5\%$	
044-072	Resistor	1M Ω	1/4W	$\pm 5\%$	
044-737	Resistor	1K Ω	1/4W	$\pm 2\%$	
044-599	Resistor	10M Ω	1/2W	$\pm 10\%$	
037-005	Capacitor	47pF	50V	$\pm 10\%$	Ceramic
037-006	Capacitor	100pF	50V	$\pm 10\%$	Ceramic
035-016	Capacitor	0.01 μ F	50V	$\pm 10\%$	Mylar
035-028	Capacitor	0.1 μ F	50V	$\pm 10\%$	Mylar
032-099	Capacitor	1 μ F	35V	$\pm 10\%$	Tantalum

PS-22 Power Supply Board Assembly (146-022) 100V-120V

PS-24 Power Supply Board Assembly (146-024) 220V-250V

052-133B	Printed Circuit Board No. 133B				
048-001	Heatsink	No.1			
020-031	IC	723CN			
017-010	Transistor	2SD234 (O)			
018-028	Diode	ESA-B01-03C			
018-029	Diode	ESA-B01-03N			
018-022	Diode	1N4003			

028-002	Trimmer Potentiometer		1KΩ (B)		EVL-R4XA0013B
044-008	Resistor	3.9Ω	1/4W	± 5%	
044-037	Resistor	1KΩ	1/4W	± 5%	
044-042	Resistor	3.3KΩ	1/4W	± 5%	
037-008	Capacitor	470pF	50V	± 10%	Ceramic
032-033	Capacitor	10μF	16V	± 10%	Electrolytic
032-068	Capacitor	470μF	35V		Electrolytic
010-038	Wafer Terminal	A-2461-8C			

PS-24 Only

012-003	Fuse Holder	TF-758		
008-024	Fuse (Midget)	0.5A	SGA 0.500	
076-069	Label No.69			

Control Panel Assembly

010-010	Housing Receptacle		A-2139-8	
042-015	Pin Terminal		2578T	
044-009	Resistor	4.7Ω	1/4W	± 5%
044-031	Resistor	330Ω	1/4W	± 5%
044-037	Resistor	1KΩ	1/4W	± 5%
044-043	Resistor	3.9KΩ	1/4W	± 5%
044-048	Resistor	10KΩ	1/4W	± 5%
044-050	Resistor	15KΩ	1/4W	± 5%
044-060	Resistor	100KΩ	1/4W	± 5%

